APPENDIX I
AUDIO CONTROL PANEL AND AUDIO SWITCH ASSEMBLY EQUIPMENT

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I-1 INTRODUCTION

This appendix details CommPower's design of the Console Replacement System (CRS) audio control panel (ACP) and audio switch assembly (ASA) and supports the installation, operation, maintenance, training and support of the ACP and ASA.

This appendix is organized as follows:

I-1 Introduction	Introduces the topic of the appendix, describes its organization, and presents a general description of the ACP and ASA.
I-2 Installation	Describes the step-by-step procedures for installing the ACP and ASA.
I-3 Operation	Describes the step-by-step procedures for operating the ACP and ASA.
I-4 Technical Description	Contains a detailed description of the ACP and ASA, including performance characteristics, external interfaces, reliability, maintainability and availability (RMA) characteristics, physical characteristics, power interface (I/F) characteristics, and environmental and electro magnetic interference (EMI) characteristics.
I-5 Periodic Maintenance	Describes the step-by-step procedures for performing preventive maintenance on the ACP and ASA.
I-6 Corrective Maintenance	Describes the approach to corrective maintenance for the ACP and ASA as well as the step-by-step procedures for isolating and replacing faulty lowest replacement units (LRU) in the ACP and ASA.

I-1.1 General Purpose and Description of the ACP

The ACP is customized to match or replicate CRS human/machine interface (HMI) operational functions and allows the operator to take control of the CRS during *backup live* (BUL) operation and perform critical broadcast transmission functions normally available by way of the CRS HMI. Each of the two operator positions provided with the CRS have an ACP, and operate completely independently of each other.

When using the ACP during BUL, message output is limited to analog voice routed directly from one or both of the two operator microphone inputs to selected configured transmitters, circumventing all CRS computer components. Additionally, the ACP provides the operator with the capability to sequence and control alert tone, transmitter transfer tone generation, and NOAA Weather Radio Specific Area Message Encoder (NWRSAME) message generation to transmitter output channels.

The ACP connects to the collocated main processor (MP) with and audio cable and an RS232 serial data cable. In addition, the combined CRS transmitter output monitoring, playback, and BUL junctions are supported by two-way audio connections and an input/output (I/O) control cable to the ASA in the equipment room. The interfaces are designed to allow the ACP (and hand/headset) to be relocated to the AWIPS position within the operator environment at some future time.

The ACP has connectors for an operator handset (4-pin RJ11) or headset (5-pin XLR) and four Government Furnished Equipment (GFE) NWRSAME units in support of BUL broadcast mode.

The key ACP functions are:

- Monitor/Playback channel select, locally and remotely MP controlled.
- Microphone input level adjustment.
- Operator Earphones audio source (Mic or Pb), select and adjust.
- BUL voice broadcast mode, select and adjust.
- BUL NWRSAME plus Alert and Transmitter Transfer Tones, select and adjust.
- Audible Alarm, sound and reset.
- Transmitter Silence Alarm, display and coordinate with MP.
- Backup Font-End Processor (FEP) in use, display and alert.
- Database Not Ready Indicator.
- On Air indicator.
- ACP to ACP intercommunication.

For a detailed (low level) functional description of the ACP, refer to section I-4.1. For a discussion of the operating characteristics of the ACP (particularly those associated with the ACP's controls and indicators), refer to section I-3.1.

I-1.2 General Purpose and Description of the ASA

The ASA is mechanically based upon the standard Versa Module Euro (VME) card cage that specifies card cage slot pitch, module height and depth, card cage external dimensions, maximum allowable dissipated power per module, and signals to the individual active audio switch modules (ASM) providing buffered and isolated transmitter outputs.

Figure I-1 shows the physical layout of the ASA. The front view shows the card cage with the audio switch controller (ASC), left, the maximum 15 active ASMs, and a spare ASM. Thirteen of the 15 ASMs are assigned as transmitter output channels and two are assigned as playback channels for ACP1 and ACP2 operators. The dual power modules are installed below. The rear view illustrates the common backplane printed circuit board (PCB), with connections for the ASC (control, status, and audio signals) and ASMs.

Each active ASM attaches to the backplane when inserted into the VME cardframe, and the front panel provides 3 RJ-11 connectors for:

a. Connection to the designated FEP audio output channel (DECtalk board).

b. Connection to the designated NWR transmitter audio circuit (OUT1).

c. Connection for the telephone tap audio output (OUT2).

ASMs can be removed and replaced without turning the power off and with no adverse effects on the operation of the other modules.

The spare ASM is located at the right side of the VME cardframe, readily available for swapping with a faulty ASM on the backplane.

A maximum of three active FEPs connect to 13 audio switch modules as the maximum number of audio sources for the corresponding NWR transmitters with playback channels 1 and 2 (PB1 and PB2) assigned to operator loopback of non-transmitted programs and/or system testing. In total the ASA accommodates 15 ASMs, i.e., 13 transmitter outputs and two playback channels.

By re-addressing a given active broadcast program in the FEP, and by moving the corresponding transmitter connection to one of the playback channels, a malfunctioning ASM can be replaced by one of the playback channels. Alternatively, the spare ASM can be installed.

Under normal operational conditions, it is practical to “assign” PB1 to operator 1 and PB2 to operator 2, although the selection of monitor/playback channels is available free-of-choice on each ACP.

The ASC module is the component responsible for audio cross-switching by way of the backplane PCB. This module also performs the actual switch-in of the backup FEP (up to five audio channels). Discrete control characters from the parallel printer interface of the backup FEP determine which block of the audio output channels (which FEP) is being “replaced”. Figure I-2 and Figure I-3 identify the individual ASC functions in block diagram form.

The dual paths of BUL audio from the two operators are provided with individual cross-switches on the ASMs for optimized reliability, and the two monitor/playback connections back to the two operators are likewise provided with separate cross-switches for individual selections.

Finally, each ASM has a 10-second silence alarm detection circuit at the output (see Figure I-4 for the ASM block diagram), and the 13 detector outputs associated with transmitter outputs are loaded into separate shift registers by the ASC in preparation for serial data transfer to the two ACPs. Masking of possible false alarms is performed by the ACP under control of the MP.

Other status conditions included in the repetitive 48-bit serial transfer to the ACPs are:

- Acknowledgment of selected channels during BUL or emergency override (EO) operations.
- Acknowledgment of the selected playback channel for each ACP.
- Acknowledgment of which active FEP is being replaced by the backup FEP.
- Acknowledgment of various discrete control signals.

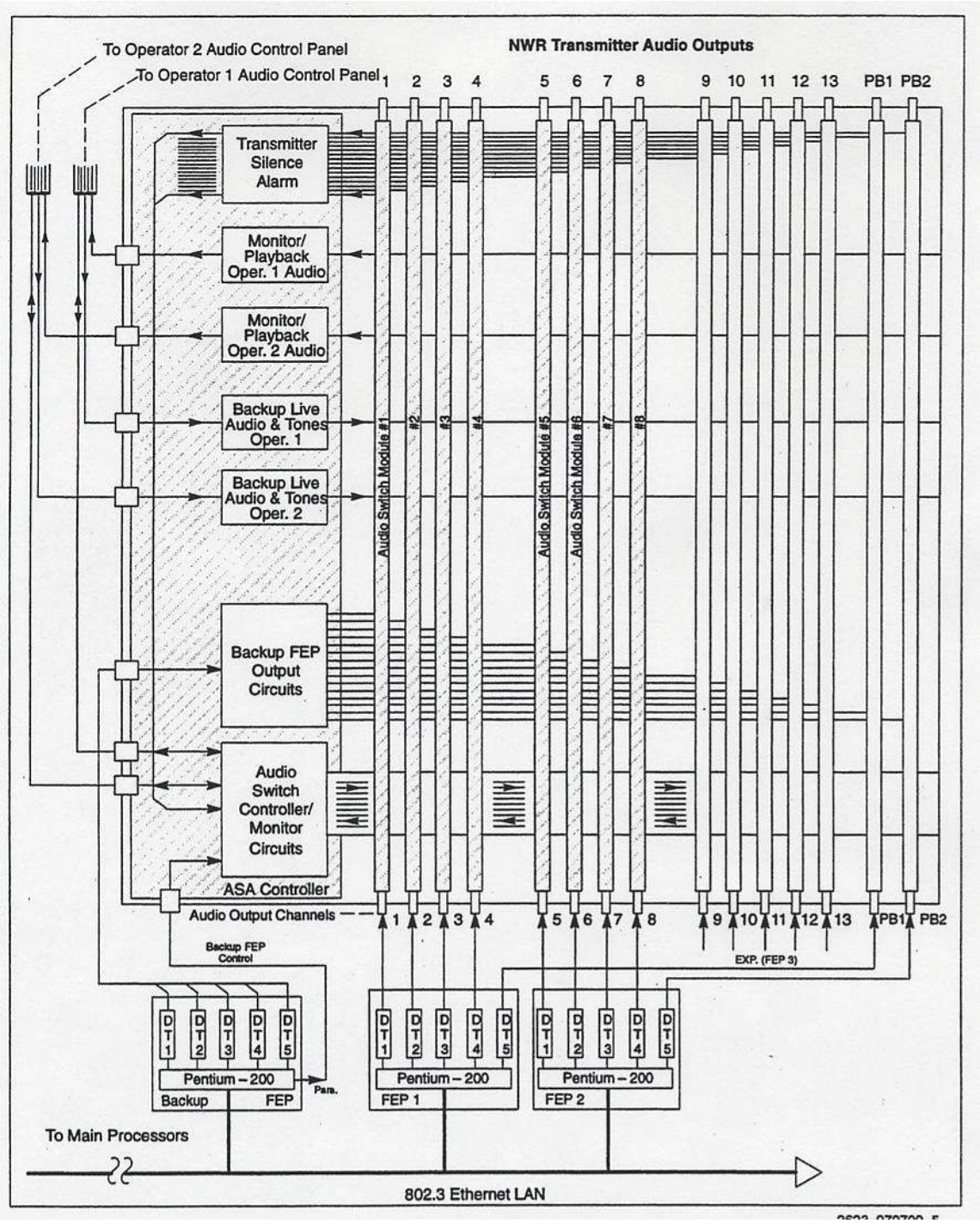


Figure I-1 CRS ASA Unit Block Diagram (Populated for Large Configuration)

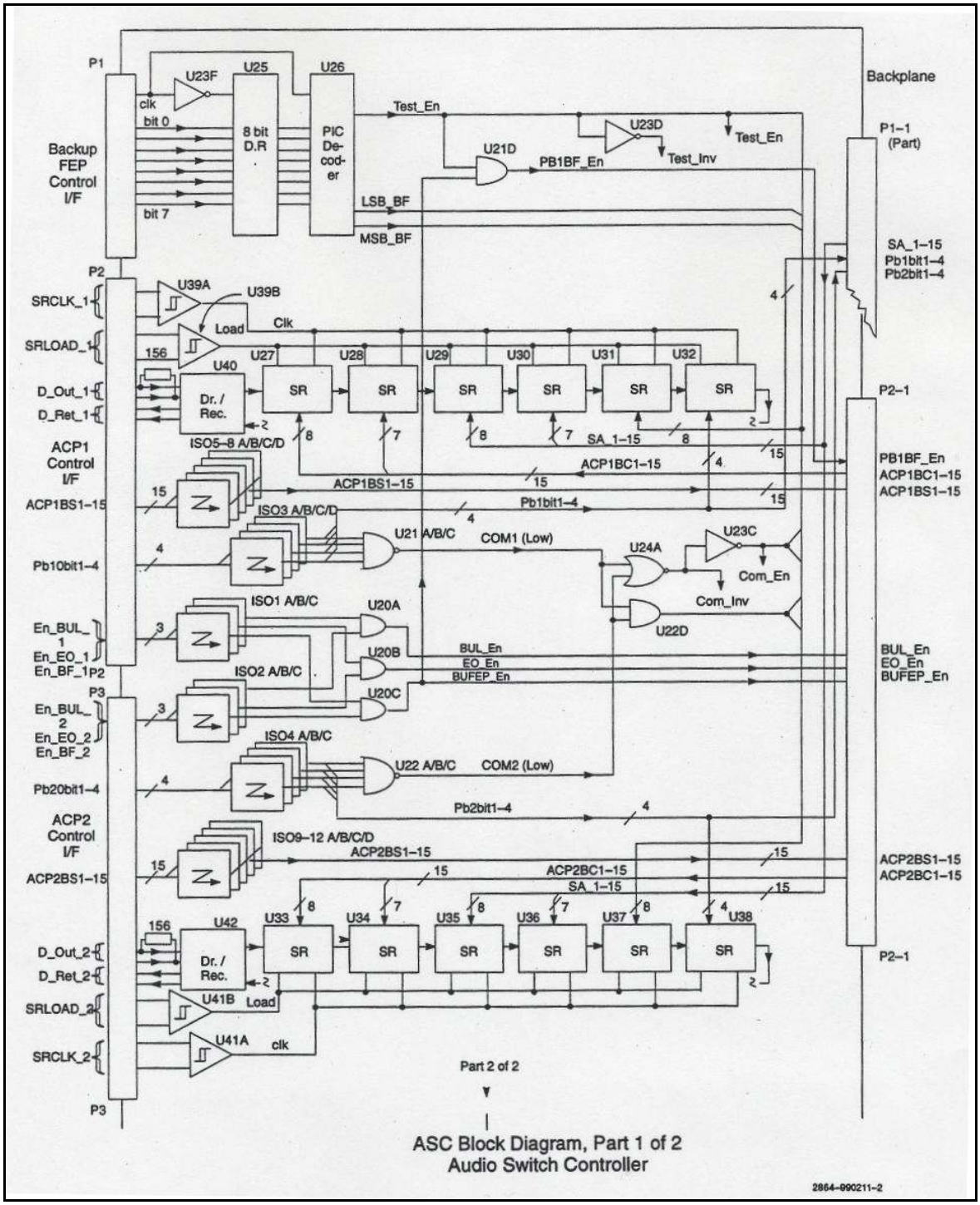


Figure I-2 ASC Block Diagram (Part 1 of 2)

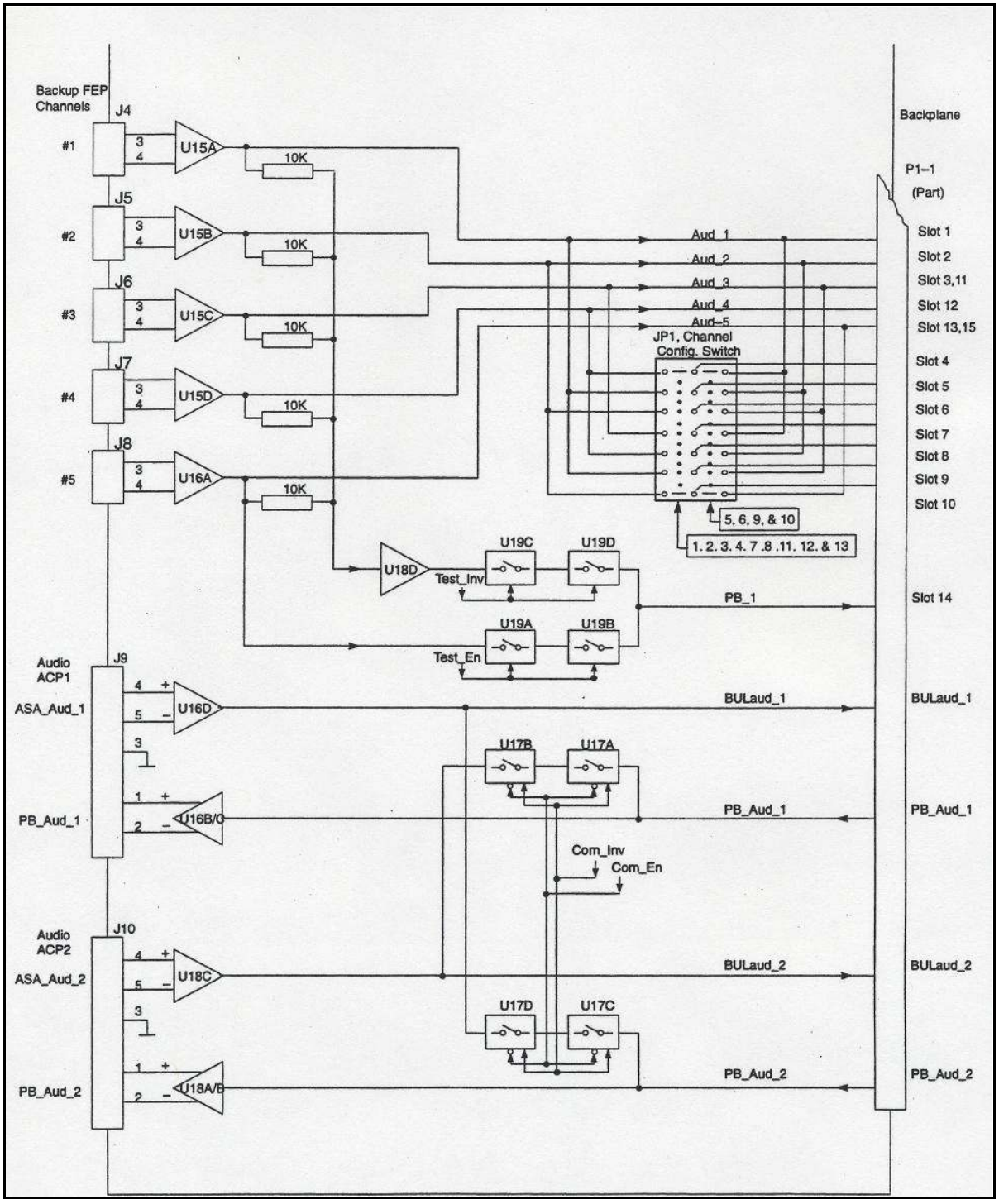


Figure I-3 ASC Block Diagram (Part 2 of 2)

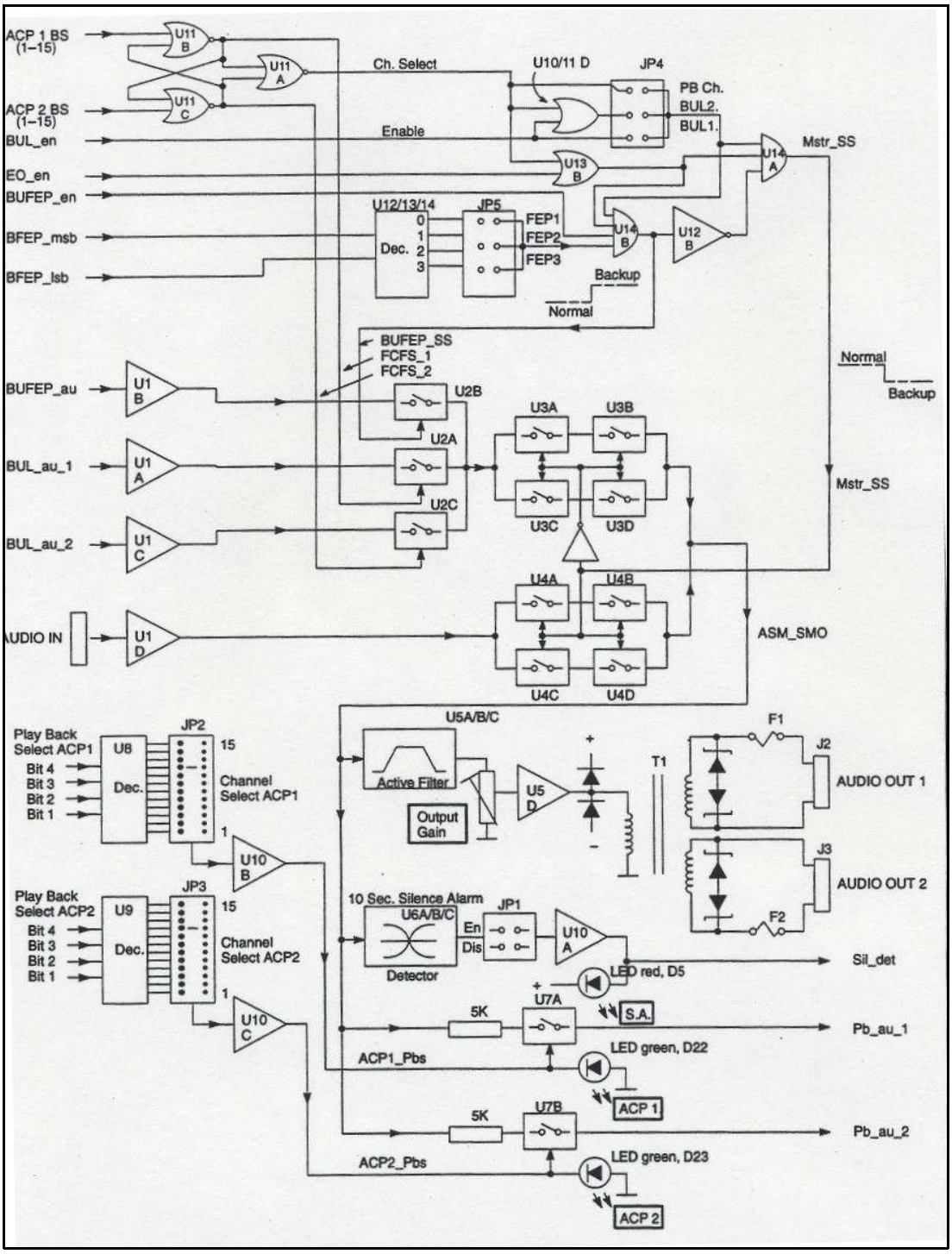


Figure I-4 ASM Block Diagram

I-2 INSTALLATION

I-2.1 Installing the ACP

I-2.1.1 Preparation for Installation

Unpack from the associated cartons and verify the following items to be free of physical damage sustained during transit:

1. ACP (with optional Symetrix voice processor installed)
2. Headset
3. MP Interface Serial Data Cable
4. MP Interface Audio Cable

I-2.1.2 Integration

Perform the following steps to integrate the ACP with the other CRS system components:

1. Place the ACP on the workstation's table opposite the sliding tackboard so the backside of the ACP is accessible for cabling.
2. To connect the MP interface serial and audio cables, use the following substeps:
    a. Connect the MP interface serial cable to the DB9 connector (labeled MP CONTROL) on the backside of the ACP, by routing the cable through the access hole of the workstation to the COM 2 connector on the MP.
    b. Connect the MP interface audio cable to the 3-pin XLR connector (labeled MP AUDIO) on the backside of the ACP, by routing the cable through the access hole of the workstation to the MP computer, and connecting the cable to the 50-pin IDC connector on the MP with the white dot facing right.
3. To connect the ACP to the ASA audio and control cables, use the following substeps:
    a. Connect the ASA audio cable to the 5-pin XLR connector (labeled ASA CONTROL) on the back of the ACP.
    b. Connect the ASA control cable to the DB 37 connector (labeled ASA AUDIO) on the back of the ACP.
4. Connect the headset to the 5-pin XLR connector located on the front of the ACP.

The ACP is now fully integrated into the CRS and is ready to accept up to four connections of NWRSAME units on the 4-pin XLR connectors located on the rear panel (labeled NWRSAME INPUTS).

I-2.1.3 Checkout

Upon successful completion of ACP installation and integration, the ACP can be powered up (and thus "checked out") by toggling the power switch on the rear of the ACP. The ACP goes through a momentary "all on" indicator test before defaulting to a full configuration transmitter

site. Silence alarm(s) may or may not occur depending on site-specific circumstances. To silence the audible alarm, press the **Channel Select** button. When the ACP and MP communicate, the configuration displayed by way of the indicators automatically changes to reflect the transmitter configuration specified (or configured) for the given CRS site.

Verification of the ACP's audio and control interface with the ASA can now be effected by selecting a given channel in the BUL label area and the corresponding playback channel using the **Channel Select** switch, enabling BUL by way of the **Enable** button (also in the BUL label area), and then speaking into the microphone. Your voice should be heard clearly on the headset; if necessary, adjust the volume using the Mic and Headset volume controls.

I-2.2 Installing the ASA

I-2.2.1 Preparation for Installation

Unpack from the associated carton and verify the following items to be free of physical damage sustained during transit:

1. ASA assembly as populated with modules
2. Spare ASC

I-2.2.2 Integration

Perform the following steps to integrate the ASA into the CRS configuration:

1. Place ASA in equipment rack when hardware is provided (see Figure 3-4 of the *CRS Maintenance Manual*).
2. Plug in the two AC power cords at the rear.
3. Install the control cables into the two ASC male DB-37 connectors (see Appendix A Figures A-15 and A-16 of the *CRS Maintenance Manual*).
4. Install the audio 1 and 2 cables into the ASC male 5-pin XLR connectors.
5. Install the TEL-CO cable connectors from DECtalk cards into the ASC and ASM modules as required.
6. Install the backup FEP control cable into the male DB-25 connector.

I-2.3 Checkout

Initial checkout of the ASA comprises of verification of the three power voltage indicators on each of the power supplies as they are turned on. Verification of the individual ASM silence alarm detector circuits is easily performed by disconnecting the audio input from the respective DECtalk boards, one at a time, and observing that the "S.A." red LED indicators light up after 10 seconds.

Other verification actions of individual audio paths are performed by using the ACPs as the "user interface" and after the preferred jumper settings have been made as described in section I-3.2.1.

I-3 OPERATION

I-3.1 Operating ACPs

I-3.1.1 ACP Set-up Procedure

For normal operations, no specific set-up procedures are required for the ACP, except for Transmitter Transfer/Alert Tones dip switch settings and voice processor settings (see sections I-3.1.1.1 and I-3.1.1.2). Keep in mind these settings are pre-set at the factory prior to shipping the system and therefore do not need to be set at the site, unless, the settings were changed for some reason, and need to be set back to the default settings.

For BUL operations, the transmitter channels to be broadcast must be selected in the BUL label area, and the *Mic* volume must be adjusted for proper output, as indicated by the VU meter.

I-3.1.1.1 Dip Switch 1 (DS1) Settings

Dip Switch 1 is located in the left front of the ACP main circuit board and labeled DS1. The proper settings for each of the switches comprising DS1 are provided in table I-1.

Table I-1. Dip Switch 1 (DS1) Settings

Switch	Setting
Pri/Sec	Enabled
Sec/Pri	Enabled
Alert Tone 1 ("AL 1")	Enabled
Alert Tone 2 ("AL 2")	Disabled
Alert Tone 3 ("AL 3")	Disabled
Alert Tone 4 ("AL 4")	Disabled
Alert Tone 5 ("AL 5")	Disabled

NOTE: The settings given for Alert Tones are default settings and can be changed or reconfigured as desired at the site.

I-3.1.1.2 Voice Processor Settings

The settings for the voice processor (at the back of the ACP) are provided in table I-2.

Table I-2. Symetrix Voice Processor Default Settings

Voice Processor Control	Default Setting
Channel 1	
Expander: Threshold Release	 -7 FAST
Compressor: Threshold Release Ratio	 -20 FAST 10
Limit: Threshold	 3
Out: Gain	 6
In/Bypass:	IN
***Stereo/Dual Mono*:**	**Dual Mono**
Channel 2	
Expander: Threshold Release	 -7 FAST
Compressor: Threshold Release Ratio	 -20 FAST 10
Limit: Threshold	 3
Out: Gain	 6
In/Bypass:	IN

When adjusting these settings, refer to Figure I-5 as necessary for the location of the associated controls. For additional information on either the Voice Processor and/or on how to adjust these controls, refer to the *Symetrix Voice Processor commercial off-the-shelf (COTS)* manual.

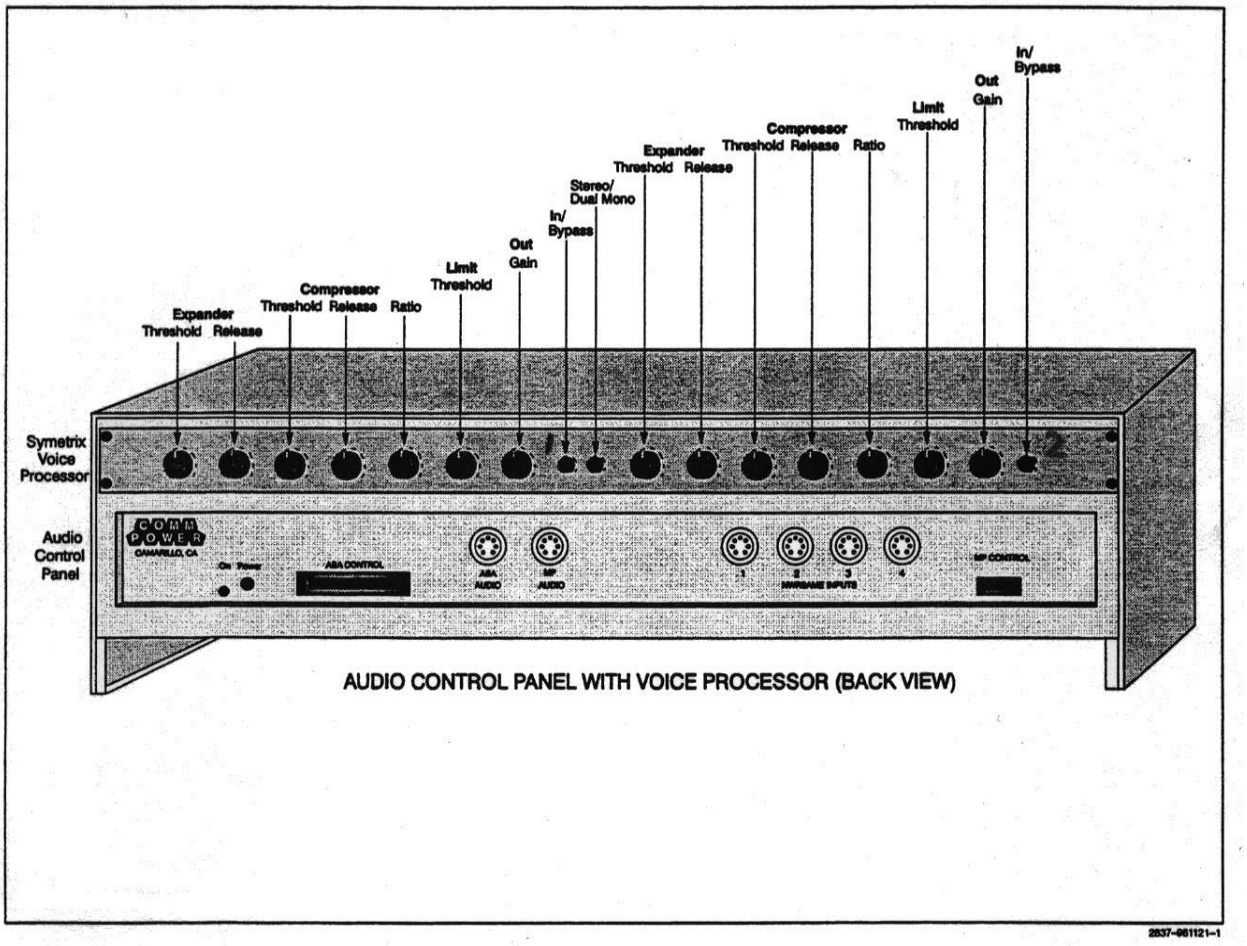


Figure I-5 ACP with Voice Processor (Back View)

I-3.1.2 Operational Characteristics

The operational characteristics of the ACP are described by control/indicator. Refer to Figure I-19 for the block diagram, and Figure I-5, Figure I-7, and Appendix A, Figure A-7 of the *CRS Maintenance Manual* for the mechanical layout (and location) of the ACP controls and indicators.

Control/Indicator	Description
a. Monitor/Playback Channel Select	The rotary selector labeled *Channel Select* allows you to choose one of the 13 transmitter output channels labeled 1, 2, …13 for monitoring purposes, or you can select one of the two designated playback channels labeled *PB1* and *PB2* as part of program preparation, editing, and other verification purposes.

Control/Indicator	Description
	The rotary selector is surrounded by 16 backlit position/status indicators representing channels 1 through 13, PB1, PB2, and Com (for Intercom). The indicators are site configurable using the site configuration table on the MP, such that the indicators lit represent a given site's allocation of transmitters. The lighting scheme for these indicators is as follows: • Green represents an available transmitter channel. • Slow blinking yellow represents a chosen transmitter channel; i.e., yellow is the "pointer indicator" of the rotary selector. • No illumination represents no transmitter allocation and therefore an un-selectable channel (i.e., the rotary selector skips past the channel). The rotary selector has no hard stops and will rotate indefinitely. This enables you to change from the PB1 channel to transmitter channel 1 by rotating the switch merely 2 positions in the clockwise direction, as opposed to 13 positions in the counter-clockwise direction. This indicator is interactive; hence, the MPs ability to control the channel selector is fully utilized during recording and monitor/playback sessions initiated by the MP. The changes performed by the MP are simply displayed by the automatically moving "pointer indicator". Thus, should you select channel 1 (using the CRS user interface software) for the purpose of monitoring, the ACP indicator for channel 1 would automatically change from green to slow blinking yellow indicating this channel selection. The manual rotary selector on the ACP, therefore, is only necessary during BUL or for browsing through the active channels during normal operations. Under control of the MP, the PB1 channel can (as a test function) also be used to monitor the DECtalk audio outputs of the backup FEP. This enables you to monitor the status of the backup FEP completely offline and without interrupting the active FEPs. The selected audio signal is automatically made available to the other ACP controls and functions as discussed in items b and c. Also, as described under item g, the ACP transfers the transmitter silence alarm status of all 13 CRS transmitter outputs to the MP.
b. Main Processor Audio Input Source	The MP source selection is performed by the ACP, but under computer control of the MP. For voice recording, adjust the microphone input signal on the Mic volume control, and if a monitor/playback channel is connected, verify proper audio output levels using the graphic VU meter depicted on the

Control/Indicator	Description
	MP's user interface. The microphone input level fed to the MP is manually adjustable on the Mic volume control or automatically by switching the Mic volume control to the Auto position. A positive 'click' is felt when this mode is entered. The selected audio signal's amplitude is presented and displayed on the operator display monitor by way of the VU meter. The operation of the two microphone connections is mutually exclusive. ***By engaging the XLR type headset connector, the handset microphone is disabled from use.***
c. Operator Headset Audio Volume/Input Source	Two pushbuttons labeled Mic and PB allow you to monitor either the selected monitor/playback channel (PB position), or to listen to your own voice using the microphone (Mic position). The volume for both audio source signals can be regulated using the volume control labeled Oper, enabling the headset volume to be adjusted to a comfortable level.
d. BUL Voice Broadcast Mode	Fifteen discrete pushbuttons (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, PB1, and PB2) grouped as an array within the Backup Live label area (to the right of the Transmitter Select label) allow you to pre-select the channels to be included in a BUL voice broadcast. Any and all channels can be selected, including the two playback channels (PB1 and PB2) which are not normally connected to transmitter outputs. It is not possible for you and another operator to choose the same channel simultaneously from the two ACPs. The transmitter channels are assigned on a first-come, first-served basis, and confirmation of the chosen channels to an operator is indicated by a green illumination of the corresponding indicator(s). A separate Enable pushbutton (also in the Backup Live label area) initializes the BUL voice mode on the selected channels. The volume control labeled Mic adjusts the audio signal as displayed by the VU meter, and the Auto position provides (optional) automatic level control. A mechanical click confirms the Auto position has been entered. To adjust the audio level prior to going live on transmitter outputs, you can pre-select a playback channel (PB1 or PB2) for such verification and possible adjustment.

Control/Indicator	Description
e. BUL Alert Tones, Transmitter (Tx) Transfer Tones, and NWRSAME	A pair of pushbutton switches (labeled Pri/Sec and Sec/Pri) within the Backup Live label area allow you to send the tone pair to effect a switch from a primary to a secondary transmitter, or from a secondary to primary transmitter respectively. Similarly, five pushbuttons (labeled 1, 2, 3, 4, and 5) directly below the Pri/Sec and Sec/Pri pushbuttons allow you to send any of five different alert tones. (All tones can be defeated using a row of dip switches inside the ACP. Refer to Section I-3.1.1, “ACP Set-up Procedures”.) The corresponding volume control labeled Tone in the BUL label area adjusts the audio signal for the tones as displayed by the VU meter. Four GFE NWRSAME units with manual programming capabilities will, if connected to the provided ACP interfaces, output a coded NWRSAME message to the selected transmitter output channel(s) under operator control. You can select the required NWRSAME message on the encoder keyboard and then press the transmit button on the unit when ready to release the coded sequence of FSK modulated tones. The actual transmission of the NWRSAME codes can be monitored using the headset and coordinated with your voice broadcast. The connection to the ACP includes the audio signal and a strobe signal. The encoder units also include output volume controls. The ACP handles the four NWRSAME units on first come, first served basis. Therefore, only one NWRSAME message is output from the CRS at a time. All of the NWRSAME, alert, and Tx transfer tones are output on the pre-selected BUL channels. If the tone output is to be on a different channel than the speech output, you (the operator) are responsible for making that choice. ***The ACP must be placed in BUL mode or one of the playback channels must be activated in order for the ACP to output any tones.***
f. Audible Alarm	The audible alarm has its own reset control integrated with the rotary selector so it can be muted whenever you become aware of an alarm condition. The alarm signal is also superimposed on the audio input to the headset, so you are made aware of the alarm condition when wearing the headset. The audible alarm is activated when alarm conditions occur and are reported to the ACP. These conditions are reported to the ACP by the ASA (over the control cable) and by the MP (over the serial data interface cable). The alarm is muted when the ACP is switched into BUL mode.

Control/Indicator	Description
g. Transmitter Silence Alarm	Thirteen indicators labeled 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, and 13 in the *Transmitter Silence Alarm* label area indicate detection of a silence alarm condition at any of the 13 transmitters. If you and/or the system expects a pause of more than 10 seconds in a given broadcast sequence (such as a NWRSAME header message gap), an appropriate mask bit may be set (manually or automatically) by the MP, shown by a green indicator on the transmitter silence alarm display. When the ACP recognizes the (false) alarm condition, it indicates the condition(s) on the panel by changing the illumination of the indicator from green to slow blinking yellow rather than by activating the audible alarm. A timeout function in the ACP eliminates the possibility of MP malfunctions leaving the ACP in a state where silence alarms are masked off on a permanent basis. In case of a true transmitter silence alarm condition, the audible alarm is activated, the corresponding visual indicator is illuminated (fast blinking) red, and the status is transferred to the MP.
h. Backup FEP in Use	Three indicators (labeled 1, 2, and 3) in the *FEP Replaced* label area serve as a reminder that the backup FEP is in use (i.e., operating in place of a failed FEP identified by one of the indicators). The replaced FEP must be returned to service to ensure required system reliability. The left indicator shows replacement of 1FEP, the center indicator shows replacement of 2FEP, and the right indicator shows replacement of 3FEP in a maximum CRS configuration.
I. Database Not Ready Indicator	An indicator labeled *DB Not Ready* is extinguished when the CRS application software has determined that the database on the shadow processor is synchronized with the database on the master processor, i.e., it is safe to change the modes (Master/Shadow) of the MPs without loss of data.
j. On Air Indicator	An indicator labeled *On Air* is illuminated anytime your voice is in direct connection with the transmitter output channels. This occurs not only in BUL, but also during emergency override, where the MP selects the transmitter output channels on which the operator's voice is broadcast live.

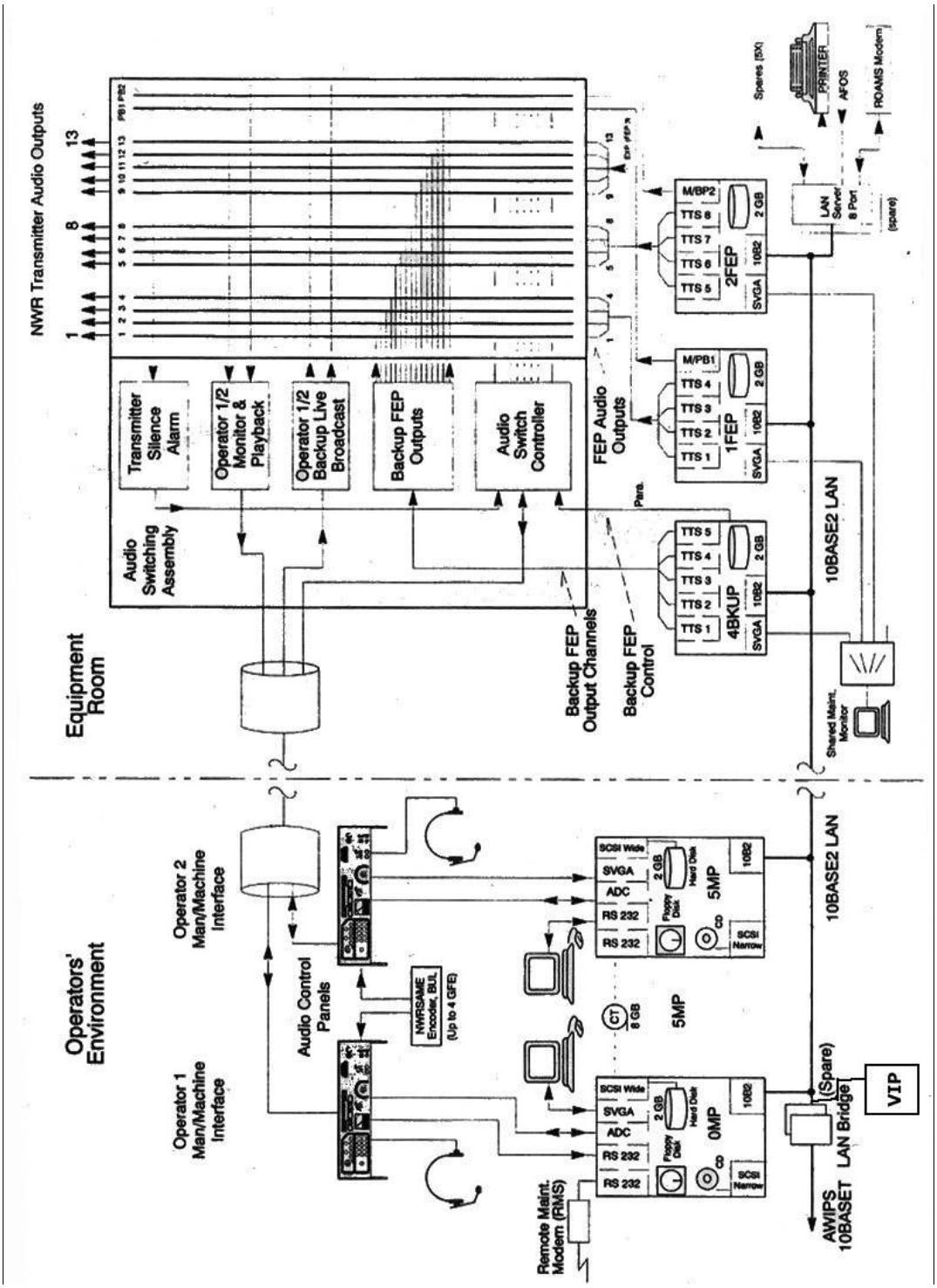


Figure I-6 CRS Hardware Block Diagram, Large Configuration

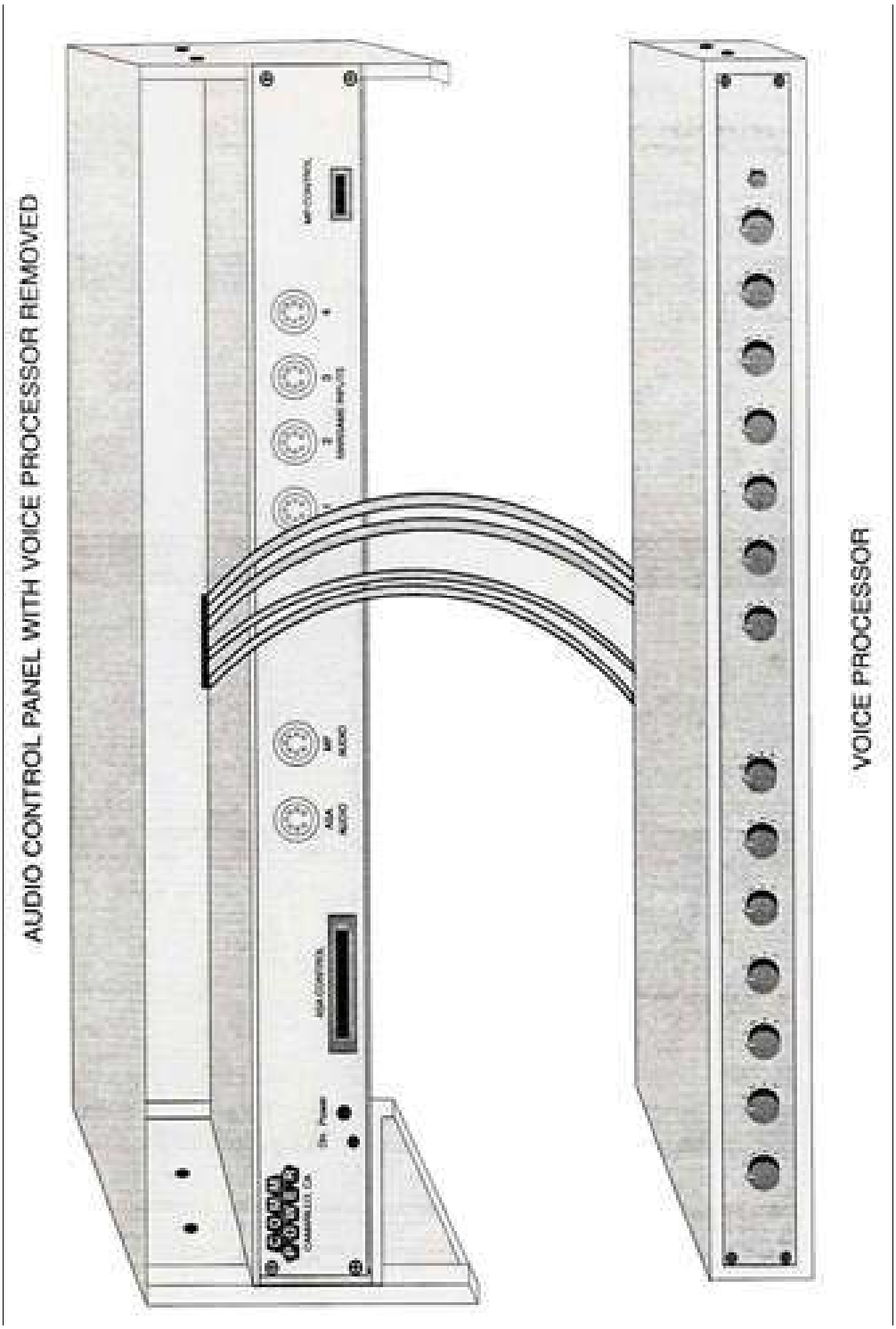


Figure I-7 ACP-Voice Processor Removed

I-3.1.3 Standards and Tolerances

The ACP is capable of producing transmitter transfer tone sequences as well as alert tones. Table I-3 specifies the respective frequencies, tolerances, and durations for these tones.

Table I-3. ACP Tone Frequencies, Tolerances, and Duration

Tone Type	Frequency	Tolerance	Duration	Tolerance
Primary to Secondary Transfer	1800 Hz followed by 2400 Hz	± 5 Hz ± 5 Hz	5 sec. 5 sec.	± 0.5 sec. ± 0.5 sec.
Secondary to Primary Transfer	2400 Hz followed by 1800 Hz	± 5 Hz ± 5 Hz	5 sec. 5 sec.	± 0.5 sec. ± 0.5 sec.
Alert Tone 1	1050 Hz	± 0.3%	10 sec.	± 2 sec.
*Alert Tone 2	1200 Hz	± 0.3%	10 sec.	± 2 sec.
*Alert Tone 3	1350 Hz	± 0.3%	10 sec.	± 2 sec.
*Alert Tone 4	1500 Hz	± 0.3%	10 sec.	± 2 sec.
*Alert Tone 5	1650 Hz	± 0.3%	10 sec.	± 2 sec.

*Not currently used–reserved for future use.

I-3.2 Operating ASA

I-3.2.1 Set-up Procedures

For normal operations, no specific set-up procedures are required for the ASA, except for ASC and ASM Jumper settings given in sections I-3.2.1.1 and I-3.2.1.2. However, these settings are pre-set at the factory and therefore do not need to be set at the site, unless, of course, they were changed for some reason and they are to be set back to their default settings.

I-3.2.1.1 ASC Jumper Settings

The ASC jumper setting is limited to one programmable 21-pin switch that must be set in one of two positions in order for the ASC to function as required at the site. This is the Channel Config. Switch (JP1), and it allows the selection of one of two settings: One that accommodates 5, 6, 9, and 10 channel configurations, or one that accommodates 1, 2, 3, 4, 7, 8, 11, 12, and 13 channel configurations. Position the jumper to match that of your configuration (left or right). The ASC Block Diagram, Figure I-3, shows the JP1 jumper panel and the two settings.

I-3.2.1.2 ASM Jumper Settings

ASM jumper settings consist of five separate switches that must be set in order for the ASM to function as required at the site (see Figure I-4). These include:

1. ***Channel Select ACP1 and ACP2 (JP2 and JP3)***. Both of these jumpers must be set to match the number of the slot the ASM goes into, i.e., 1, 2, 3, 4…13, PB1, or PB2.
2. ***FEP Select (JP5)***. Select the FEP to which the ASM belongs, i.e., 1FEP (channels 1 to 4), 2FEP (channels 5 to 8), or 3FEP (channels 9 to 13).
3. ***BUL Control (JP4)***. Select the BUL mode as BUL1 (all channels are switched by the BUL function) or as BUL2 (only selected channels are switched by the BUL function). The P.B. selection is chosen for the playback ASM(s) in the system.
4. ***S.A. (JP1)***. This jumper must be set to DIS(able) if the ASM is for playback or unused channels; otherwise, it must be set to EN(able).

The transmitter channel gain can be adjusted by using a ten-turn potentiometer, which is accessible through a hole in the front of the ASM. To adjust the gain properly for your site, perform the following steps:

1. Connect an AC volt meter to the ASM.
2. Set the channel associated with the ASM in BUL mode by pressing the corresponding pushbutton in the BUL label area on the ACP. Then click the **Enable** button (also in the BUL label area).
3. Select **Alert Tone #1** in the BUL label area by pressing the corresponding pushbutton and set the tone volume control at the **Ref. Mark**, i.e., 0dBm output from the ACP to the ASM (as indicated by the ACP VU meter).
4. Check the ASM output for the transmitter by using the AC volt meter. If necessary, increase or decrease the output by inserting a small screwdriver (through the hole in the ASM) and turning the screw in a clockwise or counter-clockwise direction.

NOTE: The actual calibration level for the ASM is somewhat dependent on the connected telephone line and transmitter input sensitivity. Consequently, when adjusting the level, compensate for these factors as required at your site. If these factors are negligible for the ASM, then adjust the gain to 0 dBm.

I-3.2.2 Operational Characteristics

The ASA operations can be controlled by either/both of the two ACPs. If one ACP is out of service, the other performs all required control and monitoring functions.

The ASC connects to the two ACPs using dualized circuitry so as to establish redundancy for the control and monitor functions. All discrete control and monitor signals are provided with

opto-isolators at the two ACP interfaces, and all audio I/O circuits are of differential design, with common mode refection capabilities. A third ASC control interface is established to the Backup FEP (BUFEP) in order to allow it to inform the ASC of selected FEP replacement actions. The printer output port on the BUFEP is connected to P1 of the ASC (see Figure I-3) and provides the backup control by presenting distinct 8-bit character formats.

In order to eliminate false FEP backup switching operations, the character format transmitted over P1 must coincide with a backup FEP enable signal released over one of the two ACP interfaces.

A unique diagnostic feature for monitoring the BUFEP has been implemented so that you can verify whether or not the BUFEP is, in fact, operational without having to perform an actual FEP replacement operation. In addition to the necessary 1FEP, 2FEP, and 3FEP backup control codes, a unique TEST character presented on the ASC P1 interface causes all five audio channels of the BUFEP to be summed together as a composite signal that is presented on playback channel no. 1 (PB1).

By controlling the broadcast program of the BUFEP, you can monitor each of the five channels one by one. Switch circuits of U19 (see Figure I-3) perform the required connection of the composite audio signal.

In preparation for the two ACP positions to be located apart from each other, and the associated difficulty for two operators to communicate, the ACP channel selector is furnished with an intercom (COM) position. By rotating the selector to this position, you can initiate a flashing light on the COM indicator of your ACP as well as on the other ACP to indicate (to another operator) your intent to communicate. The alerted operator then turns the channel selector on the other ACP to position COM, and the intercommunications capability is established while the indicators change to constant light. The ASC provides the actual cross-switching of audio I/O signals between the two ACPs (see switch circuits of U17 in Figure I-3).

The intercom feature needs to be activated at ACP power-up. To do this, merely hold in the Channel Select switch while the unit is powered-up. Then after the self-test cycle stops, turn the Channel Select switch to “COM” while continuing to hold the switch in. When positioned on COM, the reset function is released and the ACP unit confirms activation of the intercom feature by sounding three short and one long tone while flashing the indicator.

Each Phase II ASM has three LED indicators on the front panel: (1) the red “S.A.” indicator displays silence alarm, (2) the green “ACP1" indicator confirms the operator at ACP1 monitors this channel, and (3) the green “ACP2" indicator confirms the ACP2 operator monitors this channel.

The two green indicators on each ASM make verification of correct channel selection by way of JP2 and JP3 (see Figure I-4) very easy to perform. Rotation of the ACP playback channel selector causes the corresponding green LEDs to blink in a sequential manner. One LED, and only one, shall be lit for each channel selection.

I-3.2.3 Standards and Tolerances

ASA standards and tolerances consist of the following output characteristics for the ASM:

- Bandwidth: 300Hz to 3000Hz, ± .5dB according to Telephone Standard 3002
- Max. Output Power: + 5dBm into 600 ohm Load

I-4 TECHNICAL DESCRIPTION

I-4.1 ACP

I-4.1.1 Detailed Description of Design

The ACP can be broken down into four functional entities:

- The Analog Circuit
- The Digital Circuit
- The Front Panel
- The COTS Voice Processor

Each of these is discussed in sections I-4.1.1.1 through I-4.1.1.4.

I-4.1.1.1 Analog Circuit

The analog circuit is based on three types of integrated circuits: the National Semiconductor LM 380N Power Amplifier, the LM 837N Operational Amplifier, and the 74 VHC4316 Analog Switch. Using only three types of integrated circuits greatly reduces parts list complexity, minimizes the physical design's layout characteristics, and results in optimized reliability and maintainability characteristics.

The analog circuit encompasses two microphone inputs for operator voice input, one speaker level audio output for headset and handset, four audio inputs for GFE NWRSAME, two low pass audio inputs for the digital circuit's tone generators, two balanced driver circuits for audio transmission to the ASA and the main processor, one balanced receiver circuit for audio reception from the ASA and finally, four analog switch blocks for matrixing the audio path, as desired.

The two microphone pre-amplifiers differ in design, although their circuits are both based on LM837N. The amplifier for the handset is designed for an electric type microphone needing a DC bias voltage for operation. This amplifier is also single ended in design.

The headset amplifier is of the balanced reception, common mode rejection type of design offering more gain to compensate for weaker output of this type of microphone.

The audio speaker level amplifier is a single chip, mono, 1 watt amplifier, designed to use the copper ground plane of the PCB as its heatsink by way of 6 of its 14 pins. This amplifier drives impedances as low as 4 ohms.

The four balanced audio inputs available for the NWRSAME units and the balanced receiver circuit for audio reception from the ASA are of the same design. The circuit terminates across the balanced inputs with 1K ohms. These circuits are AC coupled to allow for varying possible DC offsets.

The two low pass audio inputs for the tone generator receive, shape, and buffer the tone outputs from the tone generator, which generates square wave outputs.

The two balanced driver circuits supply audio to the ASA and the ADC installed in the MP. Both drive circuits incorporate a high pass filter with a lower roll-off frequency placed at 100 Hz. Their filter slope is second order, providing 12 dB roll-off per octave. Both drivers are short circuit and capacitive load (long cables) protected by driving their respective loads through a pair of 100 ohm resistors. This also implies a characteristic impedance of 200 ohms.

The four switch blocks each contain four individually selectable analog switches with a common control line. These switches accept standard TTL logic levels on their select lines and can, therefore, be driven by the digital circuit directly. The analog switches provide very high isolation in their “off” state (>1M ohm), while their “on” state provides a negligible series resistance (<30 ohm).

I-4.1.1.2 Digital Circuit

The digital circuit is based on a PIC micro controller performing most tasks occurring in the ACP. Due to strict update or response times, a few items are handled directly by the I/O ports of the micro controller, but most logical functions/states are controlled by way of one of the three shift register chains. Data gets shifted out of the micro controller serially and when the shift is complete, the registers are strobed, where after the new data is latched at the shift register outputs.

This type of operation is used for updating the silence alarm LEDs, displaying the available and the chosen channels on the rotary selector, loading the frequency to the tone generator chip, selecting the analog switches, selecting the playback channel and the BUL channels using the ASA, selecting the source for the MP, and selecting the source for the operator headset.

The 2-bit rotary encoder is handled directly by the micro controller, as are the seven tone buttons, the serial data received from the ASA, the BUL enable selector, and the serial communication with the MP.

In addition to the micro controller and its associated shift registers, a handful of discrete generic logic devices handle the fixed logic interface selections. The one of four, “first come, first served” logic selection done on the NWRSAME unit inputs is performed by two RS latches feeding a third RS latch. Remaining gates available in the integrated circuits are used for inverting signals, adding signals, etc.

An LM556 is used to generate two clocks (½ Hz and 2 Hz) for pulsing the silence alarm LEDs and the rotary selector display LEDs. These pulses are buffered through to the LEDs as

necessary by the control logic which, in turn, is driven by any given set of real-time occurrences arising in the CRS.

The data and clock signals transmitted and received to and from the ASA are driven and received differentially. This increases not only the available distance the two subsystems can be separated but also the noise rejection capability of the interface.

Finally, the serial interface connection to the MP is handled using a simple 4-wire connection. A TTL to RS232 level translator integrated circuit is used to enable the micro controller's communication link to the MP.

I-4.1.1.3 Front Panel

The front panel design uses momentary contact closures for most switch functions and a rotary encoder for playback channel selection. The exception to the rule is the "auto" position of the Mic volume control and the BUL Enable switch, which are not momentary but hard contact closures.

The front panel design allows interaction from the MP by way of the micro controller using momentary switches that always default to a neutral position. The rotary encoder is without a mechanical pointer, making use of the encompassing LEDs as a "virtual" pointer. This again, allows full MP interaction. Only the Tone and Mic volume level controls are limited to front panel control.

I-4.1.1.4 The COTS Voice Processor

The dual-channel Symetrix voice processor is a COTS item, which mounts into the rear of the ACP. Its functions are enabled when the Mic volume control is completely turned counterclockwise to the auto position and the mechanical "click" is engaged. For further details, refer to the supplied *Voice Processor Operator's Manual*.

I-4.1.2 Performance Characteristics

The final ACP design complies with the specified audio frequency range of 100 Hz to 4000 Hz, and the resulting total harmonic distortion (less than 1% anticipated), signal-to-noise ratio, output signal levels, etc., are all well beyond telephone circuit standards.

I-4.1.3 External Interfaces

The external interfaces of the ACP are broken down and described in table I-4:

Table I-4. ACP External Interfaces and Descriptions

Interface	Type	Description
ASA/Headset	Mic. Level Audio	XLR 5-pin audio connector, female, balanced Mic input
	Speaker Level Audio	Speaker output, 4 ohm impedance capability, gnd.
ACP/Handset	Mic. Level Audio	Modular jack, female, RJ11, unbalanced Mic input
	Speaker Level Audio	Speaker output, 4 ohm impedance capability, gnd.
ACP/ NWRSAME	Line Level Audio Strobe Signal, TTL	XLR 4-pin audio connector, female, balanced line input, strobe signal and gnd. (4x)
MP/ACP	Line Level Audio	XLR 3-pin audio connector, female, balanced line output
	RS 232	DB9 data connector, female, TXD, RXD, CTS, RTS, gnd.
ACP/ASA	Line Level Audio	XLR 5-pin audio connector, male, balanced output, balanced input, gnd.
	Data & Control Signals	DB50 data connector, female, power, status, control, select signals

I-4.1.4 Physical Characteristics

The ACP is housed in a painted steel enclosure, dimensioned after the 19 inch rack mount standard. The design of this miniature 19 inch rack enclosure keeps the ACP and its associated voice processor raised above the work surface to facilitate room beneath the MP for its keyboard.

The front panel itself is fastened into this 19 inch rack enclosure with four screws as is the COTS Symetrix voice processor in the rear of the enclosure. This design ensures future compatibility with other or different equipment.

I-4.1.5 Power I/F Characteristics

The ACP requires 24 volts DC ± 5% supplied by the ASA using the control cable interface. Inside the ACP resides a DC to DC power conversion block responsible for supplying the circuitry with the required + 12, - 12 and + 5 volts DC. This power block also serves as galvanic isolation for the power supply to optimize noise immunity from the ASA and other systems in the surrounding environment.

I-4.1.6 Environmental and EMI Characteristics

The ACP is certified to comply with FCC Class B computer equipment regulations. The ACP meets its functional specifications over the combined temperature (60° to 90° F) and humidity (30% to 80% relative humidity, non-condensing) ranges of the Weather Forecast Office Operations Area in which it is installed.

I-4.2 ASA

I-4.2.1 Detailed Description of Design

The ASA can be broken down into three functional entities:
- The ASC
- The Audio Switch Backplane
- The Audio Switch Module

Each of these is discussed in sections I-4.2.1.1 through I-4.2.1.3 (reference Figure I-1 through Figure I-4 for Block and Schematic Diagrams, and Figure I-8 and Figure I-9 for Mechanical Drawings).

I-4.2.1.1 ASC

The ASC is the interface between the ACP and the ASA. The audio inputs to the controller use the same National Semiconductor LM 837N integrated circuits as do the inputs to the ACP. The integrated circuit is used to differentially transmit and receive the audio signal to and from the ACP. One National Semiconductor 74 VHC 4316 analog switch is used to connect the audio signals of ACP1 together with the audio signals of ACP2 for the purpose of operator-to-operator intercommunication, when desired.

Two 48-bit shift registers are clocked individually by each ACP, providing the ACPs with status information from the ASA. The data and clock signals of the two registers are translated and received differentially, besides being galvanically isolated using opto-couplers. Forty more opto-couplers are used to provide galvanic isolation of the control signals between the ASA and the ACPs as well as to eliminate the potential problem of ground loops.

A decoder and summing circuit devised of four discrete logic integrated circuits enable and provide status of the communication circuit, when selected.

I-4.2.1.2 Audio Switch Backplane

The audio switch backplane is a passive subassembly providing power and an electrical means of connecting the ASC to the multiple ASMs in the ASA.

The audio switch backplane is a three-layered PCB providing a signal ground plane on the two outer layers to ensure the noise immunity of the audio signals passing through it.

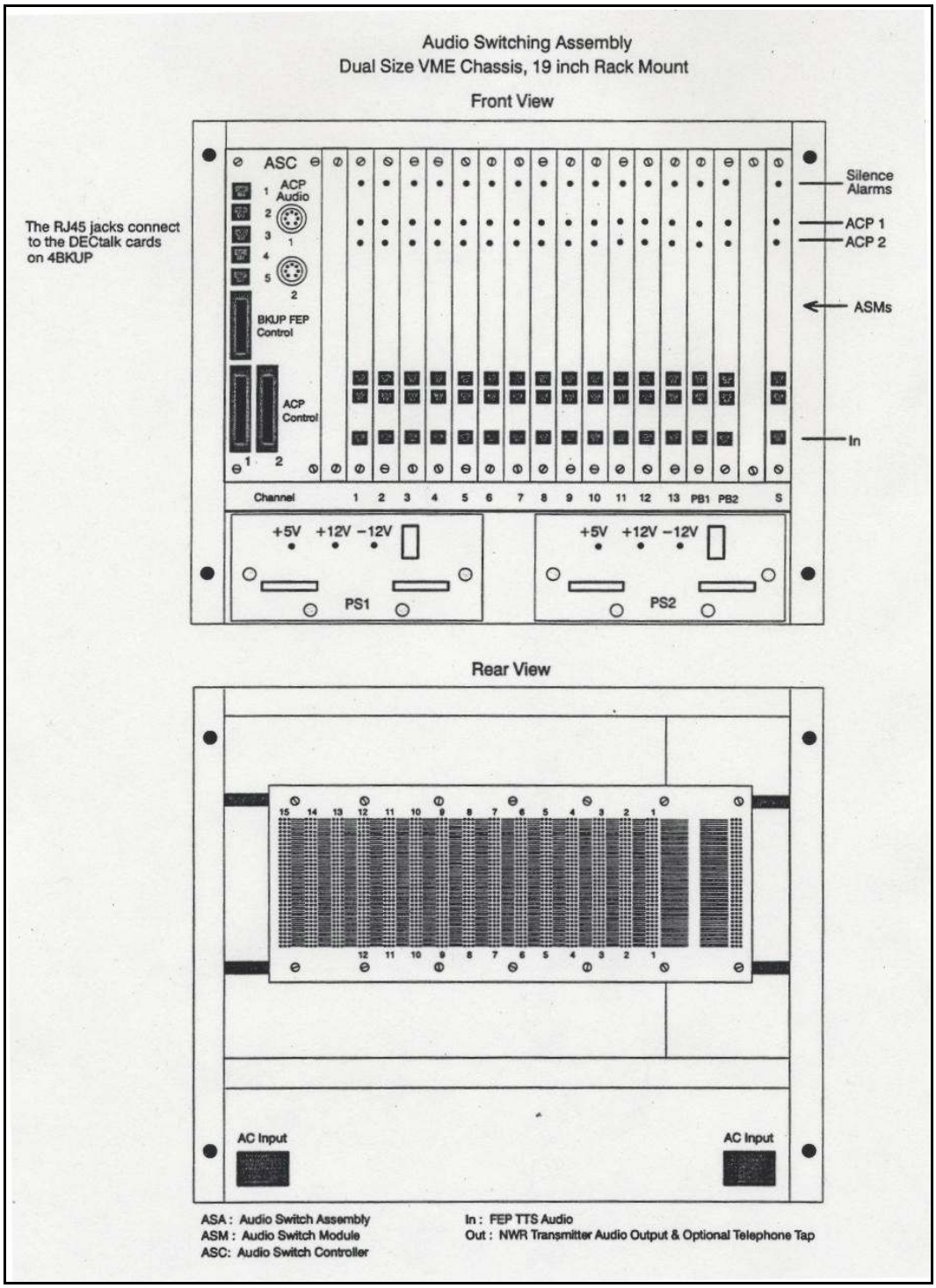


Figure I-8 Audio Patching & Switching Assembly

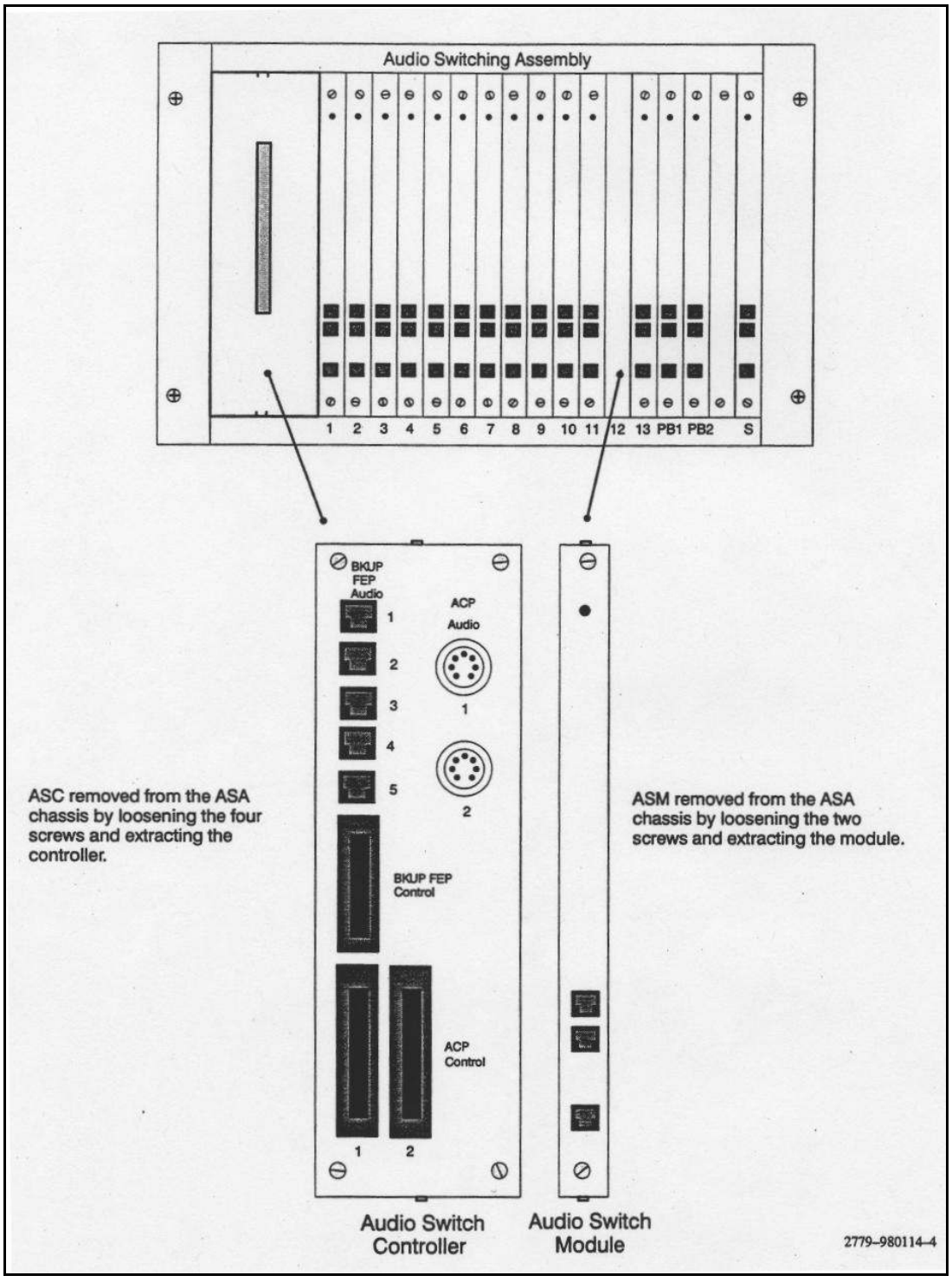


Figure I-9 ASA Controller & Modules

I-4.2.1.3 ASM

The ASM interfaces the FEP, the backup processor, and the ACP with the telephone circuit as the transmitter output.

The National Semiconductor LM 837N and 74 VHC 4316 operational amplifier and analog switch are used to receive, buffer, amplify, and matrix the audio path, as desired.

An RS latch made up of discrete generic logic gates provides first-come-first-served selection of the BUL signals received from the two ACPs.

An LM 339N comparator circuit monitors the audio output for silences greater than 10 seconds and reports to the ASC by way of the backplane. An LED is provided for visual alert of a 10 second or greater silence period on the ASM.

Two 1 of 16 decoders combined with two 1 of 15 jumper select pin headers provide audio playback selectability and addressability of the ASM from the ACPs. Two front panel LEDs confirm playback selection from ACP1 and/or ACP2.

Two enable signals, one for BUL and one for emergency override, provide selection of either of these two functions from the ACP.

The ASM is equipped with a dual-output isolation transformer driven by a 300 Hz to 3000 Hz bandpass filter circuit and a protection circuit, providing the actual electrical interface to the telephone line. The output circuit incorporates a gain adjustment to compensate for telephone line amplitude variations.

I-4.2.2 Performance Characteristics

The ASA performance characteristics comply with the specified frequency range of 100 Hz to 4000 Hz (internal to CRS) and 300 Hz to 3000 Hz (external to CRS). The resulting total harmonic distortion (less than 1percent distortion), signal-to-noise ratio, output signal level, etc., are all beyond telephone circuit standards.

I-4.2.3 External Interfaces

The ASA's external interfaces are broken down and described in table I-5.

Table I-5. ASA External Interfaces and Descriptions

Interface	Type	Description
ASA/ACP	Line Level Audio Power, Data & Control Signals	XLR 5-pin Audio Connector; Male: Balanced Output, Balanced Input, Gnd. DB50 Data Connector; Female; Power, Status, Control, Select Signals
ASA/FEP	Line Level Audio	Modular Jacks (1 per module); Female; RJ11; Balanced Input
ASA/BUFEP	Line Level Audio Control Signals	Modular Jacks (5); Female; RJ11; Balanced Input Centronix 36-pin Connector; Parallel Data Ports
ASA/Phone Line (including Phone Tap)	3002 Standard Audio Range and Level	Modular Jacks (2 per module); Female; RJ11; Balanced Input, Telephone Protection Circuitry

Refer to Figure I-10, Figure I-11, and Figure I-12 for detailed cable drawings with detailed pin assignments, etc.

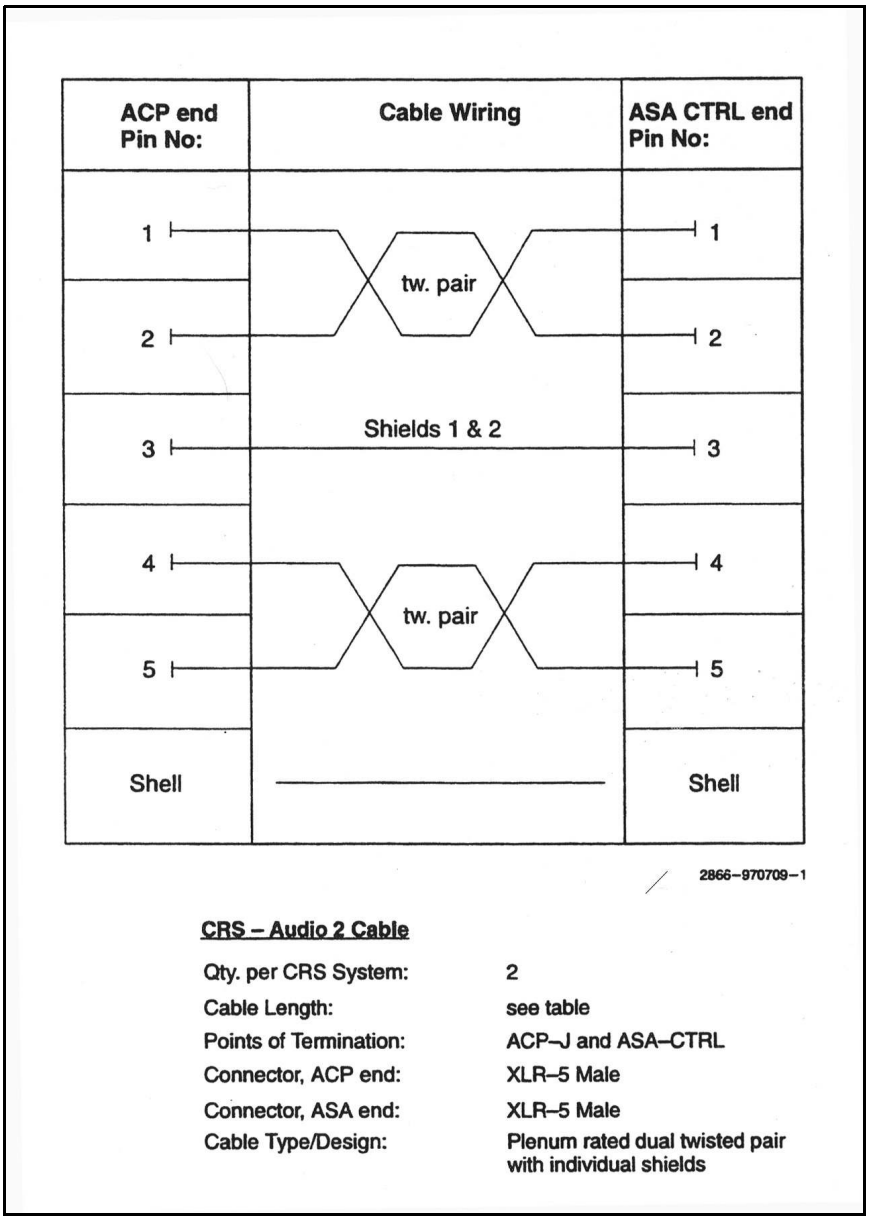


Figure I-10 CRS Audio 2 Cable Connections

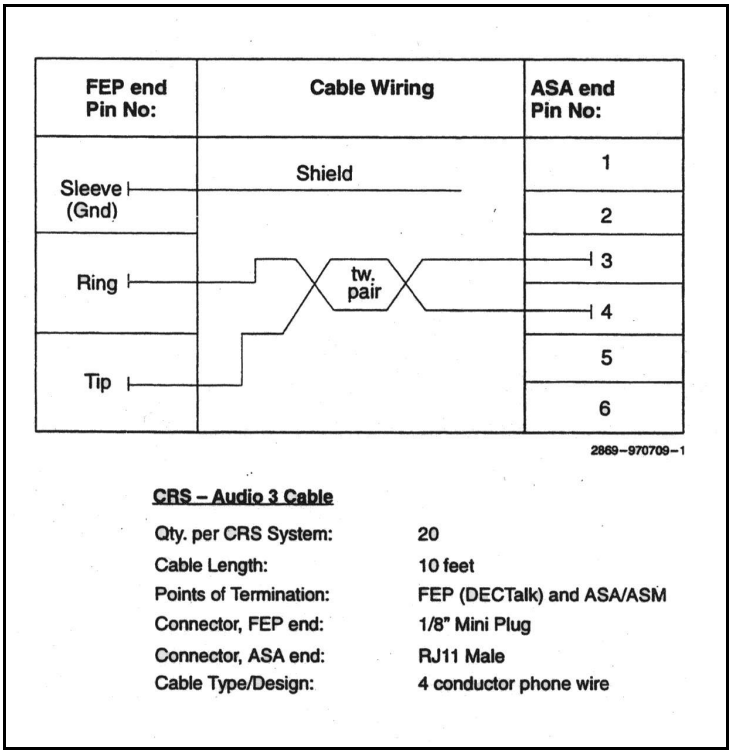


Figure I-11 CRS Audio 3 Cable Connections

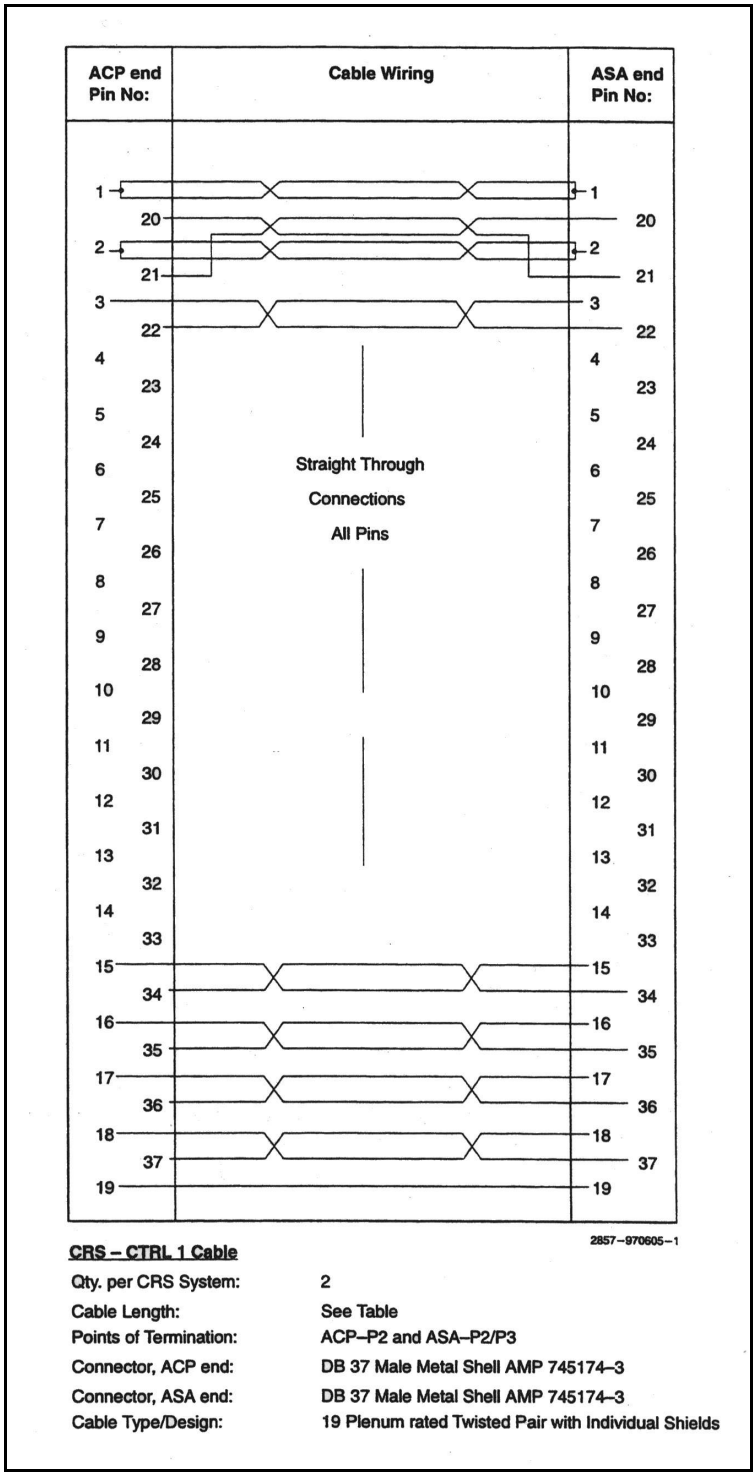


Figure I-12 CRS CTRL 1 Cable Connections

I-4.2.4 Physical Characteristics

The ASA enclosure is a COTS item. The assembly is based on a 6U standard 19 inch rack mount VME card cage. The redundant power supplies are housed below the card cage in two pull-out drawers for ease of replacement, if necessary.

The ASA is designed with accessibility in mind. All connections, excluding the AC power connection, are provided on the front of the card cage facilitating ease of installation/maintenance of ASC/modules.

I-4.2.5 Power I/F Characteristics

The ASA requires 115 VAC ± 10% and consumes a maximum of 180 watts. This is supplied directly from two distinct power distribution panels in the ASA rack.

I-4.2.6 Environmental and EMI Characteristics

The ASA is certified to comply with FCC Class B computer equipment regulations.

The ASA meets its functional specifications over the combined temperature (60° - 90° F) and humidity (30% - 80% relative humidity, non-condensing) ranges of the WFO equipment room area where it is installed.

I-5 PERIODIC MAINTENANCE

I-5.1 Preventive Maintenance Actions for ACPs

Since the ACP is basically a solid state device without any moving parts other than the switches and controls provided to allow the operator to select and execute the various ACP functions, there is no preventive maintenance required other than general cleaning of front panel functions.

I-5.2 Preventive Maintenance Actions for ASAs

Since the ASA is basically a solid state device without any moving parts, there is no preventive maintenance required other than general cleaning/dusting of exterior panels and surfaces.

I-6 CORRECTIVE MAINTENANCE

I-6.1 ACP

I-6.1.1 Maintenance Approach

The maintenance approach for the ACP consists of and hence is based on using ACP diagnostic self-tests and MP-initiated diagnostic routines to test the operational status (or “readiness”) of the ACP and its components. However, due to the redundant nature of CRS and the fact that the ACP is and LRU, this approach is simplified considerably in that a failed or faulty ACP (once diagnosed using ACP self-tests and/or MP-initiated diagnostics) can be replaced by the other ACP for as long as is necessary, while the failed/faulty ACP is sent back for repair or replacement.

NOTE: The ACP consists of the ACP enclosure, the ACP drawer, and the voice processor. The ACP drawer is the "actual" ACP LRU, since it contains the ACP main board and associated circuitry, and consequently it is this portion of the ACP that is replaced if and when it is diagnosed as faulty.

MP-initiated diagnostic routines rely on using diagnostics software (available using the CRS interface) to verify the communications link (or "handshake") between the MP and the ACP by way of interaction with the front indicators of the ACP. ACP diagnostic self-tests rely on using built-in test equipment (BITE), i.e., test equipment designed into the ACP, to test ACP components during power-up. Any failed or faulty ACP can then be quickly and easily replaced by CRS maintenance technicians. These two levels of tests are further described in sections I-6.1.1.1 and I-6.1.1.2.

I-6.1.1.1 ACP Diagnostic Self-Tests

ACP diagnostic self-tests occurring during power-up consist of a number of low-level tests executed (by the microcontroller of the ACP) in sequence to verify the operational status of the various components. These tests are primarily intended to locate faults in front panel indicators, the internal (silence alarm) beeper, and the tone generator of the ACP (used exclusively during BUL). The test sequence is approximately six seconds long and consists of the following operator-observable steps:

1. ***Lamp test***. All front panel LEDs are turned on continuously for two seconds. The 2-color LEDs used for the 13 silence alarm indicators should appear yellow (green and red mixed, not red or green). Due to the hardware configuration of the ACP, the 16 2-color LEDs surrounding the *Channel Select* knob all appear green except for the farthest counterclockwise indicators, COM and 1, which should be yellow. FEP# 1, 2, 3, ON AIR, and DB Not Ready should be on as well. After two seconds on, all indicators are turned off.
2. ***Channel Select Pointer Test***. After approximately half a second, the rotary switch pointer (*Channel Select*) is swept clockwise from 1 through PB2 to COM in approximately ¾ second, thereby testing the red sections of the 2-color *Channel Select* indicators.
3. ***Beep Test/Ready***. All *Channel Select* indicators should turn on green except PB2, which should be yellow while a Morse code V (dot, dot, dot, dash) is sounded by the on-board beeper of the ACP. This test should take approximately two seconds.
4. ***Tone Gen/Record Alert/Headphone Amp Test***. If the headset is connected, a *Record Alert* tone sequence should be heard through the headset. This sequence consists of two short bursts of 1050 Hz sine wave. Simultaneously, the *ON AIR* indicator should blink twice.

Following the tests, the serial interface (to MP) is enabled, allowing site-specific initialization to begin.

I-6.1.1.2 MP-Initiated Diagnostic Routines

MP-initiated diagnostic routines are executed from the MP (by way of the interface) and verify or confirm the communications link between the MP and the ACP using interaction with the front indicators on the ACP. To execute the routines, perform the following steps. However, prior to doing so, make sure the CRS is operational. Also ensure there are no current silence alarms, and if one should occur while executing the diagnostic routines, then re-run the routines.

From within the main display of the CRS interface (on the MP), click the left mouse button and select from the *CRS Utilities* menu either **ACP 1 Diagnostics** or **ACP 2 Diagnostics** (depending on which ACP needs to be tested). The following tests are performed:

A transmitter mask test from Transmitter 1 to full and from full to PB2

1. Turn the *Channel Select LEDs* on and off in sequence from *Transmitter 1* to *PB2* and then back.
2. Turn the LEDs on in sequence (and remain on) from Transmitter 1 to PB2.
3. Turn the LEDs off in sequence from Transmitter 1 to PB2.

An alarm mask rest of the transmitter silence alarm mask indicators

1. Turn the silence alarm mask LEDs on and then off (i.e., green, not red) one by one from left to right and then back.
2. Turn the LEDs on again in sequence from left to right but keep them on.
3. Turn the LEDs off in sequence from left to right.

A mask test of the BUL Transmitter Select LEDs

1. Turn the even and then the odd Transmitter Select LEDs on and off.
2. Turn the LEDs on and off in sequence from Transmitter 1 to PB2 and then back.
3. Turn the LEDs on in sequence (remaining on) from Transmitter 1 to PB2 and leaving them on.
4. Turn the LEDs off from PB2 to Transmitter 1.

A cycle through the transmitter mask monitor LEDs from Transmitter 1 to PB2 and back

1. Turn the Channel Select LEDs (i.e., red, not green) on in sequence from Transmitter 1 to PB2 and leaving them on.
2. Turn the LEDs off from PB2 to Transmitter !.

An FEP indicator test

1. Turn the FEP LEDs on and off in sequence from 1FEP to 3FEP.
2. Turn the FEP LEDs on and off from 3FEP to 1FEP.

A DB Not Ready indicator test

Turn the DB Not Ready LED on and off three times.

A Source Select test

Light the Source Select LEDs for Mic and PB alternating back and forth three times.

An On-air indicator test

1. Turn the On-air indicator LED on and off three times.
2. Transmit a double beep three times through the headset.

An audio alarm test

Beep the audio alarm three times.

After completing these tests, the ACP resets. Go through initialization and then return to operational readiness.

I-6.1.2 Troubleshooting Guide

If you experience a problem with either of the ACPs, you should begin the troubleshooting process by making sure the ACP and voice processor are powered on and the audio and data cables are properly connected.

If for some reason the ACP does not power-up, check the power indicators on the corresponding power supply (in the ASA). If power indicators are not on, cycle power (using the power switch). If power still does not come on, check fuse on back of ASA and if necessary replace. Otherwise, replace power supply.

If the problem with the ACP still persists and is voice related, proceed to step 1; otherwise, go directly to step 2 (i.e., the problem is not voice related).

1. Investigate a voice processor problem (i.e., with the Mic volume control in auto position no voice is heard) by ensuring the voice processor has been properly adjusted (see I-3.1.1.2). If necessary, refer to the Symetrix voice processor COTS manual for information on adjusting settings.
    a. Adjust the microphone input level using the ACP Mic volume control and see whether you get voice (i.e., you can hear yourself). If you do (i.e., in “manual” mode you hear your voice), you probably have a bad voice processor or the connection has been removed or is bad.
    b. Check connection and if necessary replace voice processor (see section I-6.1.3.4).
2. Make sure the ACP is working properly and the same problem does not exist there.
3. Execute on-line MP diagnostic routines (see I-6.1.1.2) to check handshake between MP and ACP and to verify front panel indicators.

4. If necessary, swap the ACP drawer (i.e., the ACP LRU) of the ACPs to ensure the problem is related to the ACP unit and not the cables. (See section I-6.1.3 for removal/replacement procedures.) If the problem still exists on the same unit even though it was swapped, it should be returned for repair or replacement. If it does not persist on the same unit, swap the audio and control cables to the ASC with the cables from the other ACP. If the problem recurs, it is an ASA problem and you should refer to the troubleshooting section in the ASA manual. If it does not, it is a cable problem and you should replace the cable(s).

I-6.1.3 ACP/Voice Processor Removal/Replacement Instructions

Sections I-6.1.3.1 through I-6.1.3.4 describe the procedures for removing and replacing the ACP and voice processor, respectively.

I-6.1.3.1 ACP Removal Procedure

1. Power-off the faulty ACP.
2. Disconnect the cables from the rear of the ACP including the DB9 gender changer on the MP control port.
3. Disconnect the headset from the front of the ACP (and any possible speaker connection).
4. Remove the four screws that secure the ACP to the ACP enclosure.
5. Slide the ACP drawer halfway out and remove the cable to JP5 on the main board that connects the ACP to the voice processor.

I-6.1.3.2 ACP Replacement Procedure

1. Place the replacement (new) ACP drawer on the workstation table.
2. Connect the voice processor cable to JP5 on the new ACP main board.
3. Slide the new ACP drawer completely into the ACP enclosure and secure it using the four screws.
4. Connect the gender changer to the MP control port.
5. Connect the external audio and control cables to the ACP.
6. Connect the headset to the front of the ACP (and any possible speaker connection).
7. Power-on the ACP.
8. Pack the faulty ACP drawer in the box that the replacement (new) ACP drawer came in and return it to the depot for repair/replacement.

I-6.1.3.3 Voice Processor Removal Procedure

1. Power-off the voice processor and disconnect the power cable from the AC junction box.
2. Rotate the audio control panel in a direction that facilitates removal of the voice processor.
3. Remove the four screws that secure the voice processor to the audio control panel.
4. Slide the voice processor out from the audio control panel enclosure exposing the voice processor cable assembly connected to the main board JP5 connector.
5. Disconnect the four voice processor cables.

I-6.1.3.4 Voice Processor Replacement Procedure

1. Install the replacement (new) voice processor to the rear of the audio control panel and connect the four voice processor cables to the main board JP5 connector.
2. Slide the voice processor into the audio control panel and align the four screw holes, and secure the voice processor to the audio control panel with four screws.
3. Route and plug-in the voice processor power cable to the voice processor and the AC junction box. Power-on the voice processor.
4. Adjust the voice processor according to section I-3.1.1.2.
5. Pack the faulty voice processor in the box that the replacement (new) voice processor came in and return it to the depot for repair/replacement.

I-6.2 ASA

I-6.2.1 ASA Maintenance Approach

The maintenance approach for the ASA is fairly simplistic and straightforward and entails isolating a detected problem to one of four functional entities (or LRUs) comprising the ASA (i.e., the ASC), an ASM, a power supply module, or the ASA backplane, and then replacing the faulty LRU. The actual steps for troubleshooting and replacing these LRUs are provided in sections I-6.2.2 through I-6.2.3.2 respectively.

I-6.2.2 ASA Troubleshooting Guide

If you experience a problem with the ASA, perform the following steps to further isolate the problem to the LRU level:

1. Verify that the three green indicator lights are lit on both power modules. If one of the two power supplies is inactive, try to reinitialize the unit by flipping its power switch off and back on. If the unit does not reinitialize, check the corresponding fuse at the ASA back panel and replace if necessary. If the fuse is okay, replace the power module by extracting the faulty unit and inserting a replacement unit.

2. If an ASA problem is suspected and is limited to one ASM, install a spare ASM (according to procedures given in section I-6.2.3) after setting jumpers to match those of the removed ASM. First, however, check the associated audio I/O cables for bad connections.

3. If the ASA problem still persists and is not necessarily limited to one ASM, install a spare ASC (according to procedures given in section I-6.2.3.2) after setting jumpers to match those of the removed ASC.

4. If the ASA problem still persists after having completed steps 1, 2, and 3, verify whether the malfunction(s) are limited to being associated with operations by one of the two ACPs. If so, try to exchange the ACP1-ASA audio and control cables with the ACP2-ASA cables at the ASC front panel. If the malfunction(s) is still present and unchanged, the ASA backplane is suspected and the ASA enclosure should be replaced (according to procedures in sections I-6.2.3.1 and 1-6.2.3.2).

I-6.2.3 ASA Removal/Replacement Instructions

Paragraphs I-6.2.3.1 through I-6.2.3.6 describe the procedures for removing and replacing the ASA, ASC, and ASM.

I-6.2.3.1 ASA Removal

1. If CRS is operational, perform the procedures for a graceful shutdown of the CRS application as described in the *CRS Site Operator's Manual*. When executing a shutdown of the CRS application, ***DO NOT*** press the MP reset or power buttons.

2. Remove power from the ASA by disconnecting the two power cables from the AC input jacks on the back of the ASA.

3. Disconnect the audio cables and control cables from the ASC.

4. Disconnect the FEP DECtalk-ASM audio cables, NWR transmitter audio output cables, and telephone tap cables (if present) from the ASMs.

5. With someone supporting the bottom of the ASA, remove the four screws securing the ASA to the 19 inch cabinet rack mounts.

6. Remove the ASA from the cabinet.

I-6.2.3.2 ASA Replacement

1. Install and secure with the four screws, the replacement (new) ASA to the 19 inch cabinet rack mounts.

2. Remove the controller board and modules from the faulty ASA and install in the replacement (new) ASA.

NOTE: Install the modules in the same module slots from which they were removed.

3. Connect the audio cables, control cables, and parallel cable to the ASC.
4. Connect the FEP DECtalk-ASM audio cables, NWR transmitter audio output cables, and telephone tap cables (if present) to the ASMs.
5. Plug in and route the power cables from the ASA AC input jacks to the power distribution panels secured to the inside of the cabinet.
6. Restart the CRS application according to the *CRS Site Operator's Manual*.
7. Pack the faulty ASA in the box the replacement (new) ASA came in and return it to the depot for repair/replacement.

I-6.2.3.3 ASC Removal

1. If CRS is operational, perform the procedures for a graceful shutdown of the CRS application as described in the *CRS Site Operator's Manual*. When executing a shutdown of the CRS application, ***DO NOT*** press the MP reset or power buttons.
2. Remove power from the ASA by disconnecting the two power cables from the AC input jacks on the back of the ASA.
3. Loosen the four screws securing the ASC to the ASA.
4. Extract the ASC from the ASA.

I-6.2.3.4 ASC Replacement

1. Copy all jumper settings from the faulty ASC to the new ASC.
2. Insert the replacement (new) ASC in the ASA by placing the ASC in the card guides and sliding the controller toward the back of the ASA.
3. Press the controller into the backplane connectors and firmly push into place.
4. Secure the ASC to the ASA with the four screws.
5. Connect the audio cables, control cables, and parallel backup FEP cable to the ASC.
6. Plug in the two power cables into the ASA AC input jacks.
7. Restart the CRS application according to the *CRS Site Operator's Manual*.
8. Pack the faulty ASC in the box the replacement (new) ASC came in and return it to the depot for repair/replacement.

I-6.2.3.5 ASM Removal

1. Disconnect the FEP DECtalk-ASM audio cable, NWR transmitter audio output cable, and telephone tap cable (if present) from the faulty ASM.
2. Loosen the two screws securing the faulty ASM to the ASA. Power does **not** need to be turned off.
3. Extract the faulty ASM from the ASA.

I-6.2.3.6 ASM Replacement

1. Loosen the two screws securing the spare ASM (slot 16) to the ASA.
2. Extract the spare ASM from slot 16 of the ASA.
3. Copy all jumper settings from the faulty ASM to the new ASM.
4. Insert the spare ASM in the ASA by placing the ASM in the card guides and sliding the module toward the back of the ASA.
5. Press the module into the backplane connectors and firmly push into place. Power does ***not*** need to be turned off.
6. Secure the ASM to the ASA with the two screws.
7. Connect the FEP DECtalk-ASM audio cable.
8. Adjust the output level of the ASM to match that of the replaced ASM. If necessary, refer to section I-3.2.1.2.
9. Connect the NWR transmitter audio output cable and telephone tap cable (if present) to the ASM.
10. Pack the faulty ASM in the box the replacement (new) ASM came in and return it to the depot for repair/replacement.

I-7 Cable Wiring and Block Diagrams

Figure I-10 through Figure I-20 detail the wiring of various CRS cables and connectors including the connections between the ACP printed circuit boards/connectors. Figure I-19 details the block diagram of the ACP audio circuits and switches.

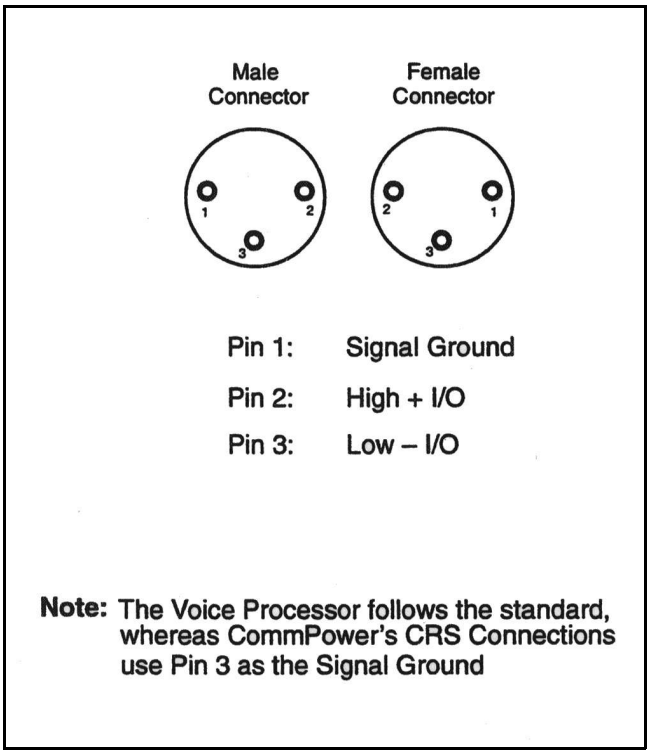
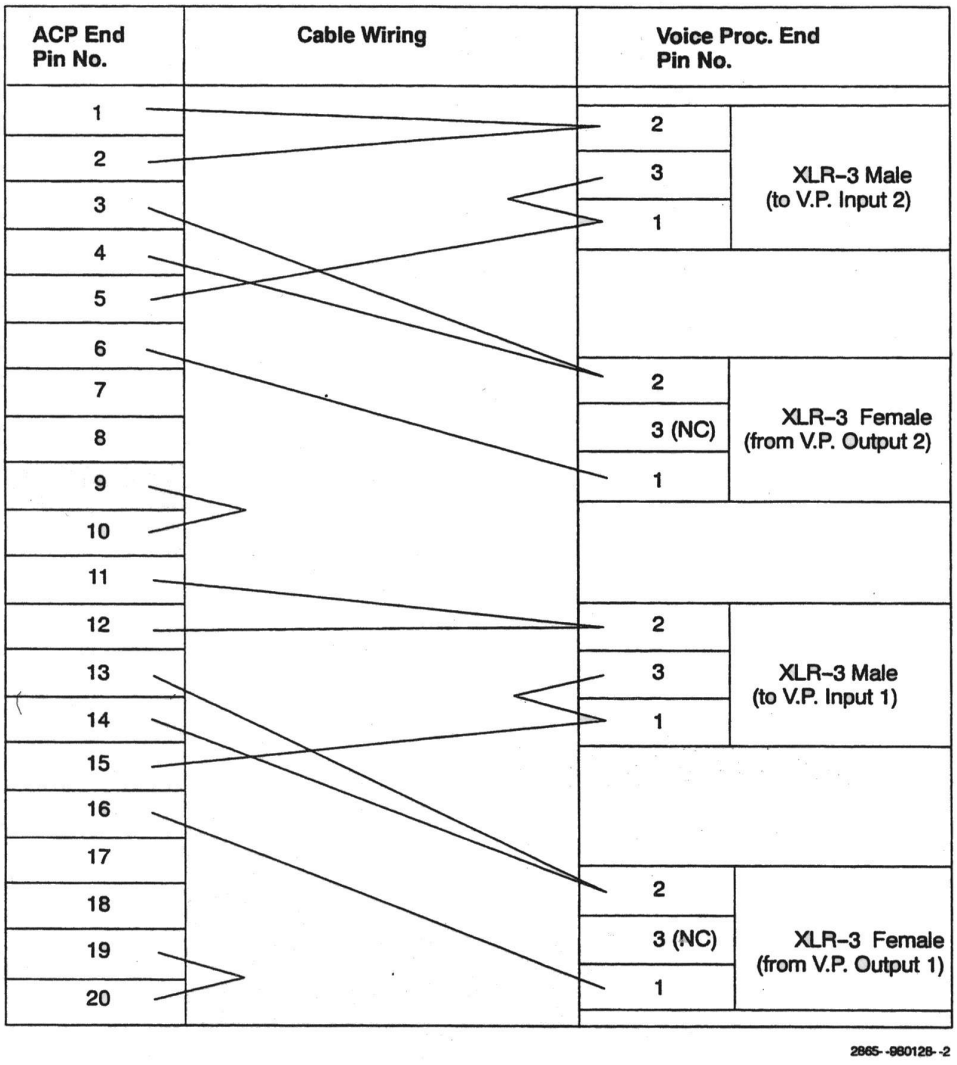


Figure I-13 XLR Standard Conventions

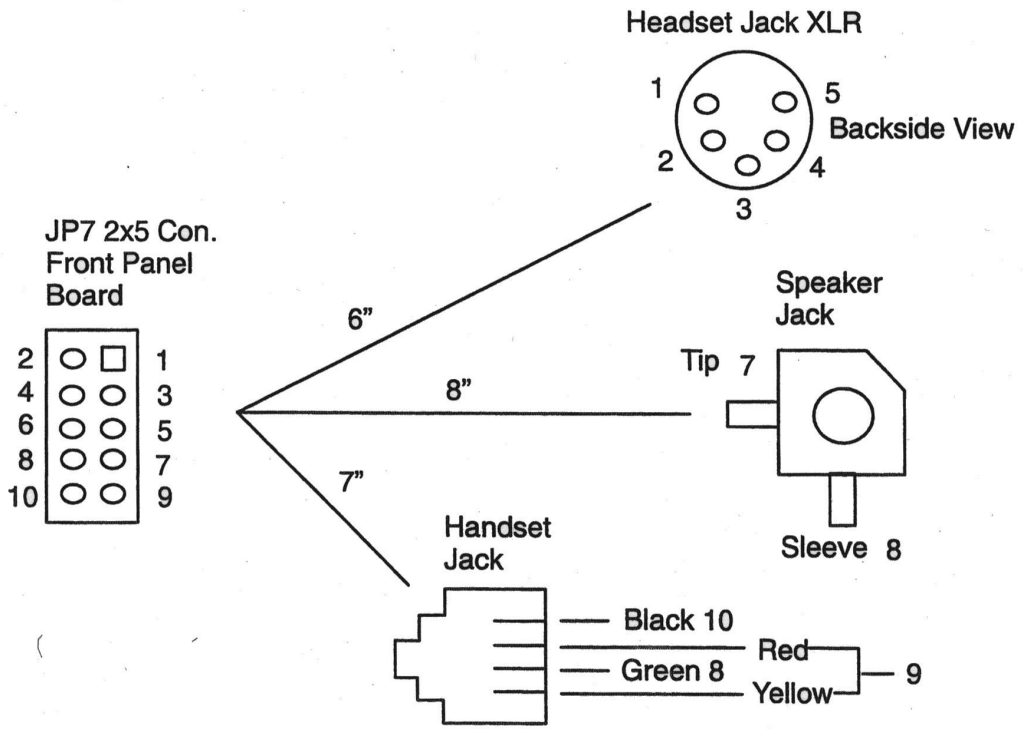


CRS – Audio 4 Cable

Qty. per CRS system:	2
Cable Length:	2 feet
Points of Termination:	ACP and Voice Proc.
Connector, Acp end:	Dual row mod 20 receptacle
Connectors, Voice Proc. end:	XLR–3 male and XLR–3 female
Cable Type/Design:	4 22 AWG Str. Twisted pair W/shield

Figure I-14 CRS Audio 4 Cable Connections

Front Panel Connector Interfaces



JP7 2x5 Con. Wire Termination Points

JP7	XLR	Speaker	Handset	Description
1	1			Mic. Input +
2	2			Mic. Input –
3	3			Signal Ground
4	4			Mic. Select, Sense Input
5	5			Earphones Output
6		6		Speaker Output
7		7		Signal Ground
8			8	Earphone Out, Handset
9			9	Signal Ground
10			10	Mic. Input, Handset

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Figure I-15 Front Panel Connector Interfaces/Wire Termination Points

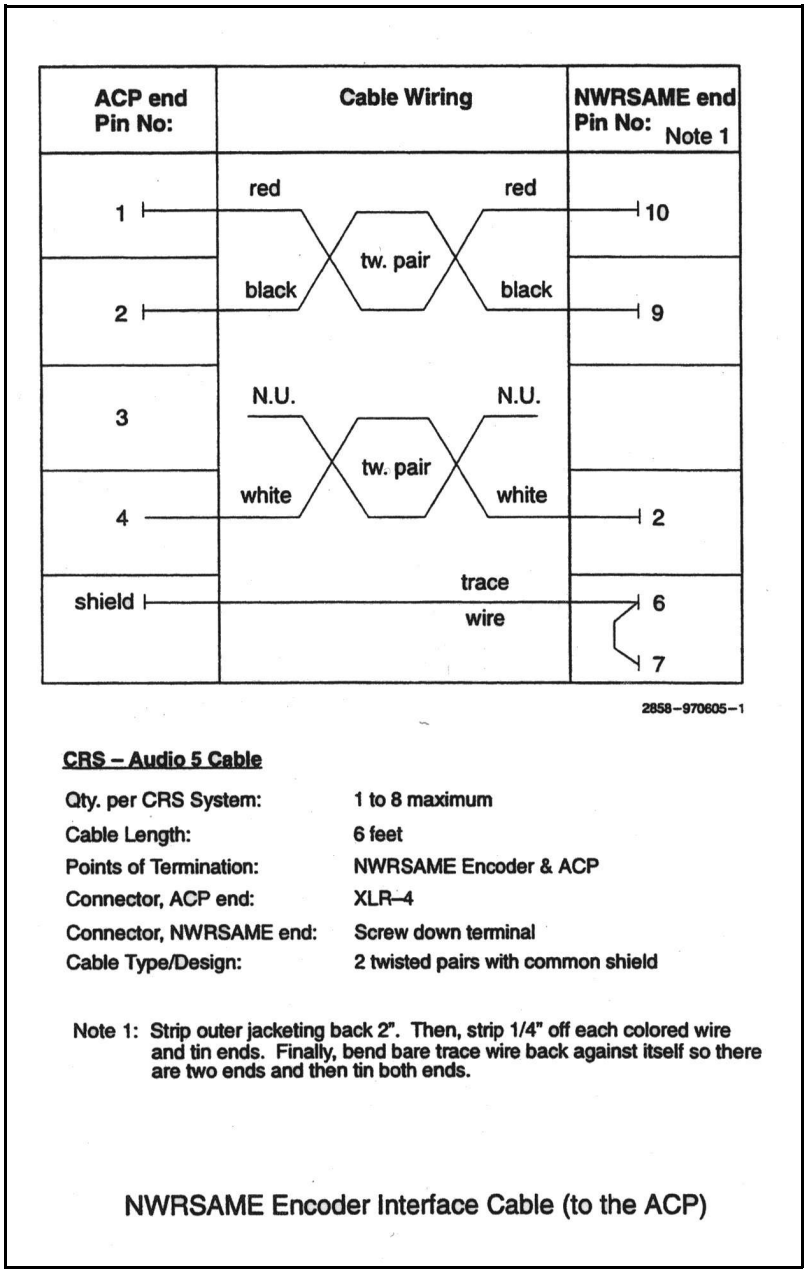
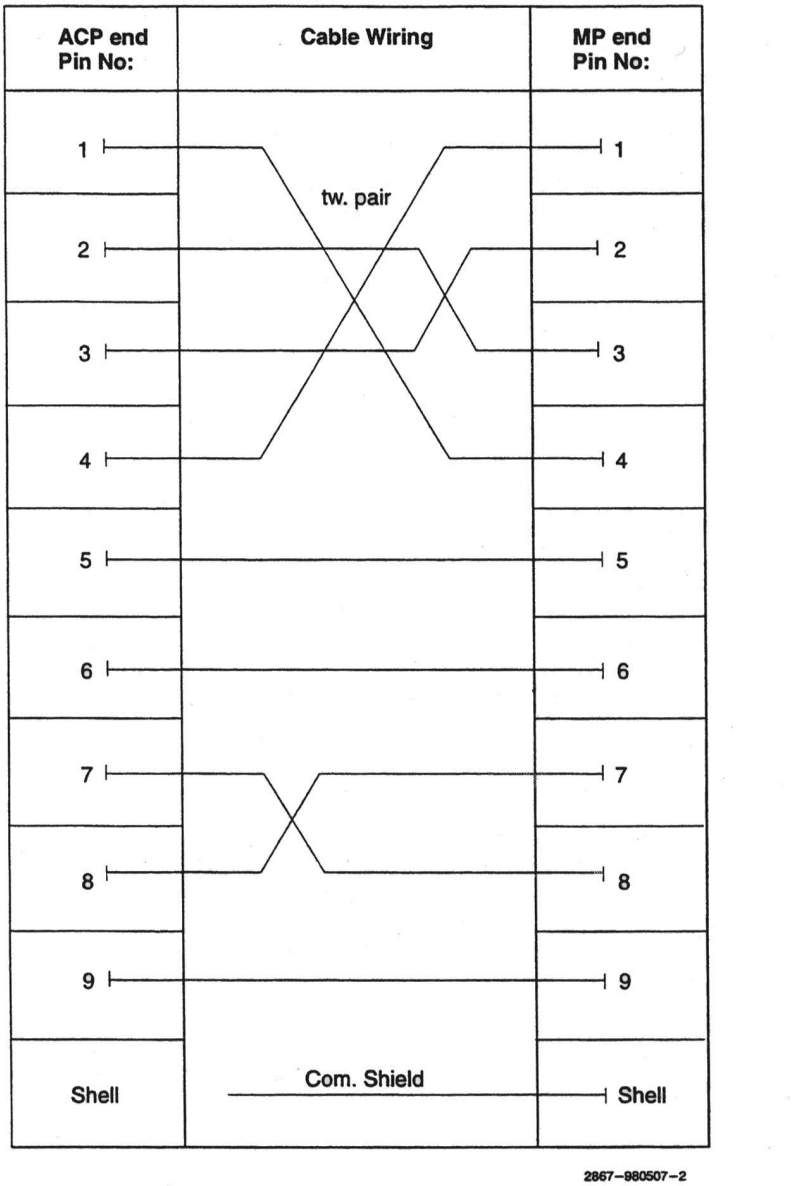


Figure I-16 NWRSAME Interface Cable (to the ACP)



CRS – Data 1, RS232 Data Cable

Qty. per CRS System:	2
Cable Length:	6 feet
Points of Termination:	ACP–P1 and MP–COM2 Port
Connector, ACP end:	DB–9 Male (male pins/female housing)
Connector, MP end:	DB–9 Male
Cable Type/Design:	9 signal wires w. common shield

Figure I-17 CRS Data 1, RS232 Data Cable Connections

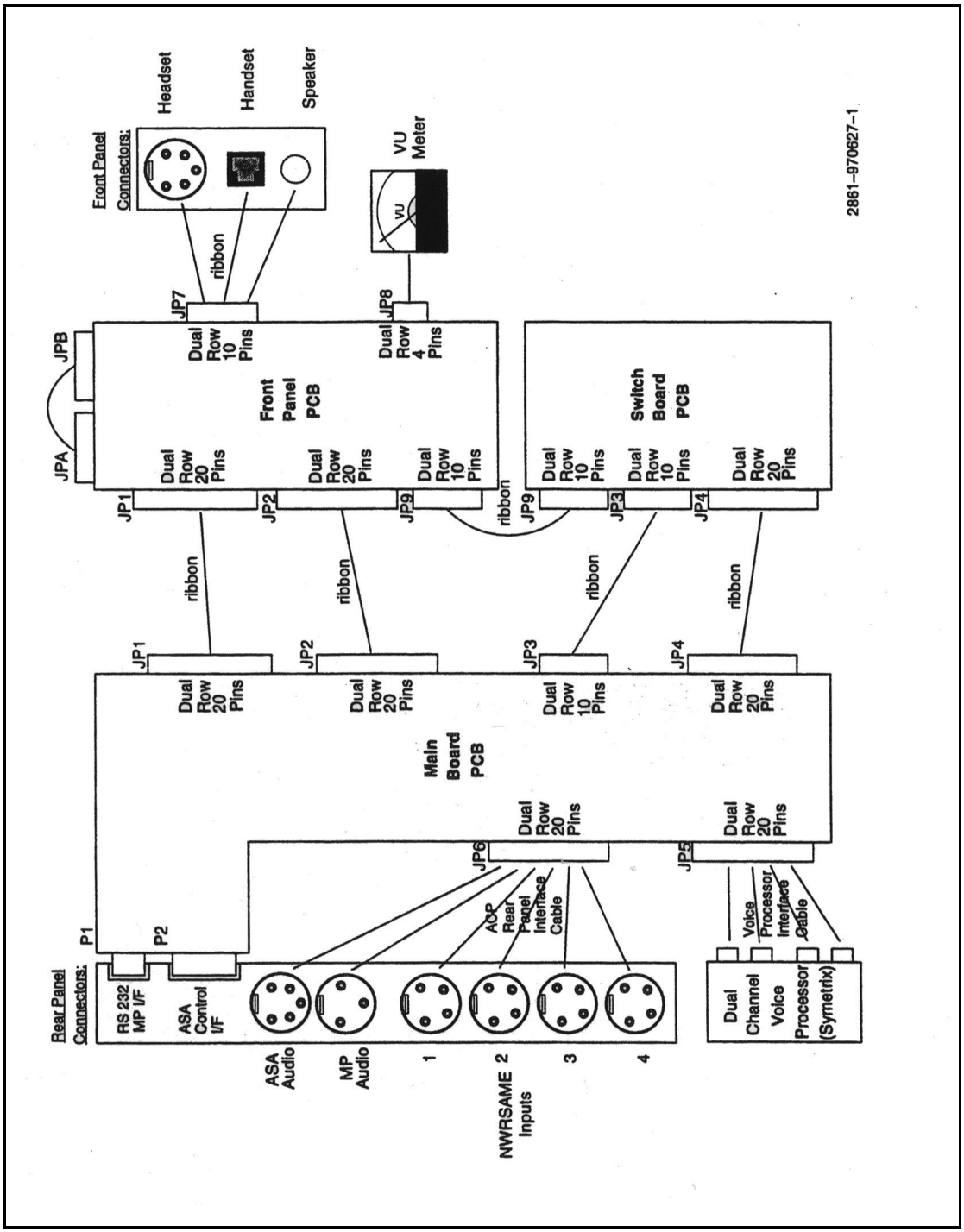


Figure I-18 ACP, Partitioning into Printed Circuit Boards & Internal Connectors

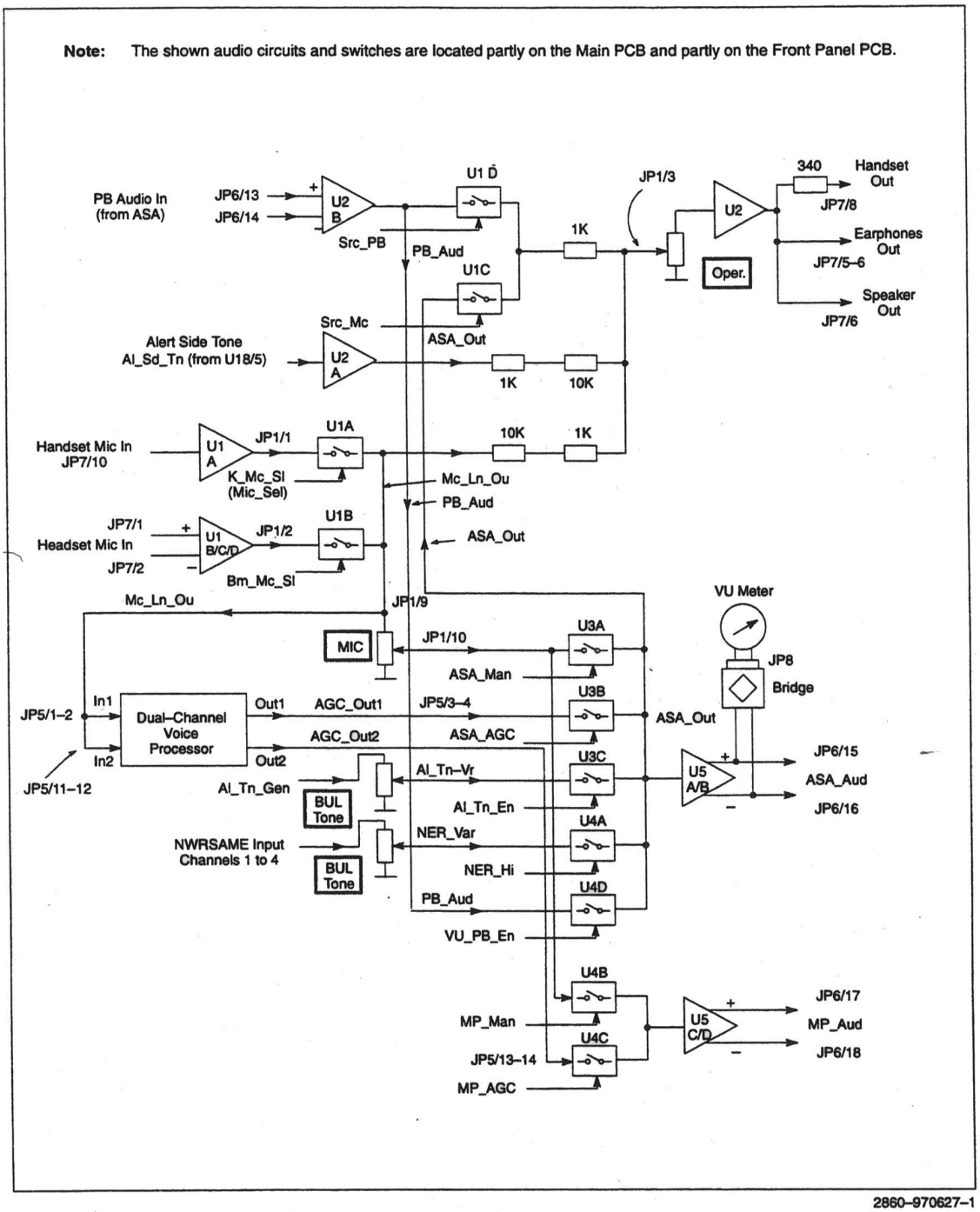
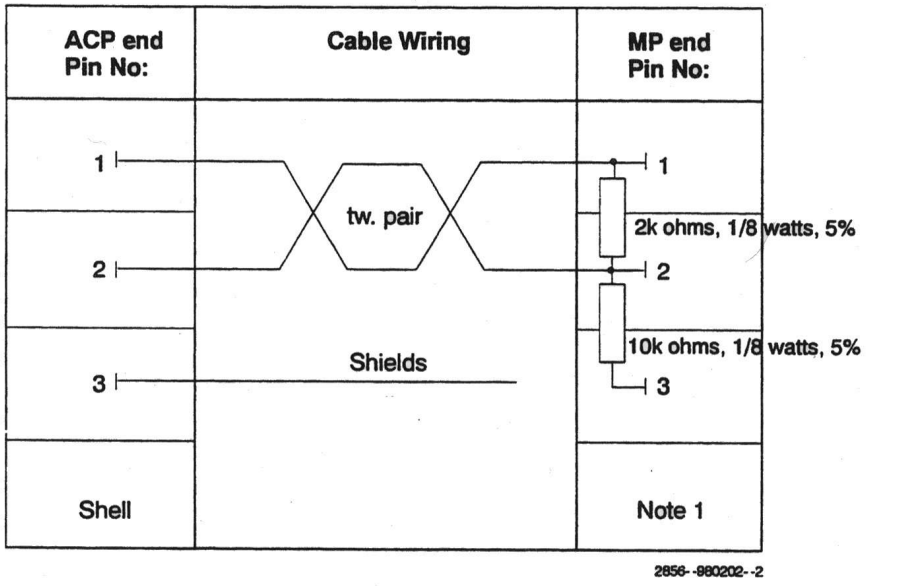


Figure I-19 ACP Audio Circuits & Switches (Main Board & Front Panel Board)



CRS – Audio 1 Cable

Qty. per CRS System:	2
Cable Length:	6 feet
Points of Termination:	ACP–J(x) and MP–ADC/Modular 50
Connector, ACP end:	XLR–3 Male
Connector, MP–ADC end:	50–pin Dual row, Modular receptacle
Cable Type/Design:	2 22 AWG Str. Twisted Pair W/Shield

Note 1: Pins 3 through 17 are all interconnected.
(All unused analog inputs to analog ground)

Note 2: Pins for XLR male connector are as follows:

Figure I-20 CRS Audio 1 Cable Connections